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March 9, 1994

Dear Reader:

Enclosed for your information is the Montana Department of State Lands (DSL) and the Bureau of Land Management (BLM) Decision Record on the corrective measures to address acid rock drainage (ARD) at the Landusky Mine.

The decision is to withhold approval of final, long-term reclamation and closure designs for ARD prevention, control and treatment until an environmental impact statement (EIS) has been prepared. The decision also includes provisions for immediate implementation of certain interim operating, control and reclamation measures to address the existing ARD situation.

The agencies will be combining analysis of corrective measures for the Landusky Mine with the EIS being prepared to consider the Zortman Mine Expansion proposal. The resulting combined Zortman-Landusky EIS will use all comments received to date on the Landusky Supplemental EA and those received during scoping for the Zortman Expansion EIS. Anyone wishing to submit additional scoping comments for the combined EIS should send them to the agencies by not later than May 2, 1994.

If you have any questions please contact either Sandi Olsen (DSL) or David Mari (BLM).

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PLEASE RETURN

**DECISION RECORD**  
**LANDUSKY MINE**  
**OPERATING AND RECLAMATION PLAN MODIFICATIONS**  
**ACID ROCK DRAINAGE CONTROL AND REMEDIATION**

**BACKGROUND:**

Zortman Mining, Inc. (ZMI) submitted to the Bureau of Land Management (BLM) and the Montana Department of State Lands (DSL) a proposed modification to the operating and reclamation plans for the Landusky Mine. This submission was in response to a decision by the BLM Montana State Director requiring modification of the existing plans under 43 CFR 3809.1-7(c); and DSL requirements for modification per 82-4-337, MCA; to address the development of acid rock drainage (ARD) at the Landusky Mine.

The agencies have evaluated the proposed modifications and alternatives in the attached supplemental environmental assessment (EA); considered public comments received on the EA; and reached the following decision.

**DECISION:**

It is our decision to require and approve immediate implementation of certain operating, control and interim reclamation modifications to the Landusky Mine Plan of Operations (MTM-77779) in order to address existing and potential acid rock drainage concerns. Construction requirements for these interim measures are to follow design parameters detailed under the Agency Modified Alternative in the attached EA (see also Part 1).

It is also our decision to withhold approval of final, long-term, reclamation and closure designs for ARD prevention, control and treatment at the Landusky Mine until the designs have undergone additional environmental analysis in an environmental impact statement (see Part 2).

**- PART 1 -**

The following actions are approved for immediate implementation to mitigate existing impacts, or required to prevent unnecessary or undue degradation from already approved activities:

1. Disposal of waste rock in the Mill Gulch waste rock dump may not resume. Material originally permitted for disposal in this facility must continue to be selectively handled and placed in the Gold Bug Pit area as engineered pit-backfill. This is consistent with the BLM State Director's decision of April 13, 1993 requiring modification of the Landusky Mine Plan of Operations. [EA ref. pages 12, 14, 15, 16, 20, 21 and 25]
2. Construction of the previously approved extension to the Montana Gulch leach pad, with associated ore loading, will not take place. Instead, the permitted ore material (11.9 million tons) will be placed on an area to be lined between and adjacent to the Mill Gulch and Sullivan Park leach pads. This alternate location has already been largely disturbed by mining activities, is smaller in areal extent than the Montana Gulch site, and is not underlain by surface flows. It therefore presents considerable environmental advantages over the previously permitted site in Montana Gulch. [EA ref. page 25] This mitigating measure is contingent upon receipt of a detailed engineering design and evaluation conducted by a registered professional engineer, which documents that leach pad stability concerns with this location have been satisfied.
3. Resloping and capping of the Sullivan Park dike will take place to limit infiltration of precipitation into this structure. Infiltrating precipitation is either the single cause, or a component, of the ARD being monitored at site L-28. Resloping and capping of this structure would either mitigate this problem or eliminate it from consideration as the likely source of ARD in Rock Creek, allowing the agencies to focus on identification of other possible sources. Once the optimal final capping scenario has been selected through the EIS process, part or all of this facility's reclamation may have to be undone, redone, or enhanced. [EA ref. pages 12, 16, 18, 25]
4. Improvements in the efficiency and size of the ARD capture and pumpback systems in Sullivan Creek and Mill Gulch will be made. These systems are not presently capturing all ARD, especially after high precipitation events. By installing slurry cut-off walls, increasing pumping capacity and sizing surge ponds for storm events these systems will be more effective in mitigation of the existing ARD-related impacts. [EA ref. pages 26 and 28]
5. Immediate capping will be conducted on the exposed Mill Gulch waste rock facility to limit further infiltration and ARD generation. This facility is to be used as a test plot for evaluating the effectiveness of several different capping scenarios. However, once the optimal final capping scenario has been selected through the EIS process, part or all of this facility's reclamation may have to be undone,

redone, or enhanced. [EA ref. pages 9, 12, and 13]

6. Construction of drainage or runoff control structures within the mine permit boundary to prevent storm waters from contacting materials with acid-generating potential or from damaging surface reclamation efforts is necessary. These structures may have to be altered later should the EIS analysis disclose other final post-reclamation drainage control needs. [EA ref. page 26]
7. Enhanced water quality monitoring, reporting and analysis as outlined in the EA will begin immediately. [EA ref. pages 21, 26, 27 and 28]
8. Placement of a water treatment plant available to treat ARD recovered by the capture and pumpback systems is necessary as an interim contingency. This treatment plant must be located on an existing disturbed area to minimize impacts. A single treatment plant at the Zortman Mine that could service both the Zortman and the Landusky Mines would meet this requirement. Presently, water treatment and discharge is not necessary for ARD recovered from the Rock Creek and Mill Gulch drainages since this solution is being used in the process circuit. Should treatment become necessary, this solution could be pumped to the Zortman Mine treatment facility. Actual discharge from such a facility must also be permitted by the Water Quality Bureau.

While this contingency measure was not specifically analyzed in the EA the use of an already disturbed area for the placement of structures is a minor modification that does not require formal approval by BLM (BLM manual section 3809.36b, 1985).

Additional details on these interim measures may be found on the pages indicated in the Landusky Mine Supplemental Environmental Assessment (EA# MT065-063-93) attached to this decision record.

The implementation of the above interim measures would not have a significant impact on the environment and a **Finding of No Significant Impact** regarding their implementation is hereby made.

## - PART 2 -

A decision regarding the final, long-term, reclamation and closure needs for the Landusky Mine will be made after completion of an EIS that addresses their appropriateness and effectiveness. Reclamation and closure include, but are not limited to:



1. Design of a final reclamation cap for all unreclaimed mine facilities; including (but not limited to) spent ore heaps, waste rock piles, mine pit floors and benches. This includes both appropriate reslope requirements plus the necessary capping sequences and performance requirements for permeability barriers, capillary break/drain layers, topsoil and revegetation. Data collected from the Mill Gulch test area will assist in establishing these criteria.
2. An evaluation of any existing reclaimed mine facilities (e.g. Montana Gulch waste rock dump) to determine whether existing reclamation should be altered to correct or prevent ARD.
3. Validation of waste rock with less than 0.2% total sulfur as non-acid generating by kinetic testing. Until demonstrated otherwise, only rock with a NNP of greater than +20 and a NP/AP ratio greater than 3 is considered non-acid generating.
4. Identification of the location, sizing and long-term maintenance of run-on/run-off control structures needed to meet reclamation objectives.
5. The size, type, operation and location of any water treatment facilities needed for ARD mitigation after mine closure; either in conjunction with source control or as a contingency measure.
6. Technical approaches to mitigation of ARD in the Rock Creek drainage should the bedrock foundation beneath the leach pad be identified as the ARD source.
7. Establishment of performance standards for water quality that: 1) meet the requirements of the Montana Water Quality Act, and 2) prevent unnecessary or undue degradation.


The above items will be considered in an EIS that evaluates operating and reclamation modifications for the entire Landusky Mine. It is our decision to combine this analysis with the EIS analysis for the Zortman Mine Expansion Project.

### **RATIONALE FOR DECISION:**

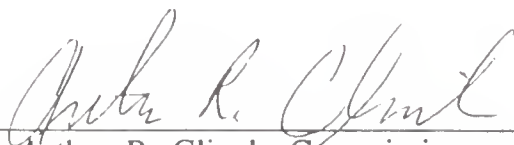
The immediate measures described above are necessary to mitigate existing environmental impacts and prevent unnecessary or undue degradation from activities that have already been permitted. This is consistent with 43 CFR 3809.1-7(c)(4) which require the operator to take measures to prevent unnecessary or undue degradation while a modified Plan of Operations is being approved.

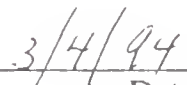
Conversely, while there is general agreement as to the approach needed for long-term reclamation at the Landusky Mine, there is some uncertainty and disagreement about exactly what these measures should entail and how effective they will be in addressing ARD. We have therefore decided to defer that decision until after an EIS is prepared that considers these measures more fully. Meanwhile, the immediate measures that have been authorized are judged to be the most effective in minimizing impacts from the existing situation, while not precluding from selection any feasible alternatives that will be addressed by the EIS, or making an irreversible irretrievable commitment of resources.

Combining analysis of the final reclamation needs for the Landusky Mine with the Zortman Mine Expansion EIS process makes good sense at this juncture. Both mines are facing similar issues which will require similar solutions, probably using shared resources. Cumulative impacts from the Landusky Mine were already scheduled to be analyzed in the Zortman EIS, so most of the baseline data has been collected. Since scoping has not yet ended on the Zortman Mine EIS, the issues identified during the Landusky Mine EA process will be addressed when developing the EIS alternatives. The resulting combined Zortman-Landusky EIS will provide a consistent, comprehensive and cumulative impacts analysis superior to that of analyzing each mine separately.

  
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David L. Mari, District Manager  
BLM, Lewistown District

  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
7/8 Arthur R. Clinch, Commissioner  
9/4 Montana Department of State Lands

  
\_\_\_\_\_  
Date

#### Attachments:

- 1 - Supplemental Environmental Assessment, Landusky Mine Operating and Reclamation Plan Modifications, Acid Rock Drainage Control and Remediation (EA# MT065-063-93)
- 2 - Responses to Public Comments





**RESPONSES TO PUBLIC COMMENTS FOR ZORTMAN MINING, INC.**

**ACID ROCK DRAINAGE AND REMEDIATION  
ENVIRONMENTAL ASSESSMENT**

**March 2, 1994**

**Department of State Lands - Bureau of Land Management**



The following comments are summarized from the numerous individual letters received on the EA. Many other comments generally adverse to or supportive of the mine in general were received and are available for review. They are not duplicated here because they are not specific to the EA.

**COMMENT:**

1. One area that I support is that we cover all areas with topsoil and allow Mother Nature to decide on the percentage of vegetation that will not survive, keeping in mind we cannot guarantee 100 percent success.

**RESPONSE:**

Reclamation must be proactive to assure noxious weeds do not become a problem and to assure soils don't erode away before revegetation.

**COMMENT:**

2. If the mine closed, many suppliers would also be put out of business.

**RESPONSE:**

Thank you for your comment.

**COMMENT:**

3. Problems I see on the streets and Emergency Rooms are not caused by mining, but by lack of jobs, alcohol, drugs, and free handouts. ZMI employment provides jobs and self respect.

**RESPONSE:**

Thank you for your comment.

**COMMENT:**

4. ZMI should not be punished because a few people are trying to shut the mine down.

**RESPONSE:**

The agencies use the criteria set forth in law regulations and policy to make decisions.

**COMMENT:**

5. Mining and continuing to take corrective actions is obviously the only course of action that is both economically and environmentally sound.

**RESPONSE:**

Comment noted.

**COMMENT:**

6. If we were as concerned about air in Billings as we are about this mine, the quality of life would be greatly improved.

**RESPONSE:**

Comment noted.

**COMMENT:**

7. If you were to close the mine, the unemployment rate would greatly increase. What are you going to do with all us miners? If you come look around the mine, you would not find dead animals or unhealthy people. This mine is not unsafe.

**RESPONSE:**

Thank you for your comment.

**COMMENT:**

8. If there is an additional need for more public meetings, I believe the meetings should be held in Zortman and Malta. These towns are affected as much as any other.

**RESPONSE:**

Meeting sites are selected based on accessibility, scope of the project, and availability of resources. Dodson is a central location available to meeting attendees from as far as Malta, Saco, Gildford, Lodgepole, Hays, Zortman, and Landusky, as well as many other communities. It is central and accessible to the public and meeting formats are designed to minimize polarization of commentors. (See responses to Freholtz, Mineral Policy Center, American Wildlands.)

**COMMENT:**

1. The meeting should have been held at Hays or Lodgepole where the people directly affected by the proposed action live.

**RESPONSE:**

See the response to comment No. 8 on the preceeding page.

**COMMENT:**

2. I for one felt a little intimidated and felt the meeting in Dodson was in hostile territory.

**RESPONSE:**

The purpose of the hearing was to solicit substantive oral comment on the analyses in the EA document.

**COMMENT:**

3. On page 23 of the EA it states, "A liner shield such as geofabric or screened tailing material, would be placed over the synthetic liner to prevent perforation." I have serious concerns about the use of tailings.

**RESPONSE:**

Tailing material (from 1930's - era mines in King Creek and Ruby Gulch) has been used in the past as cushion material over liners of leach pads at the Zortman and Landusky mines, as well as for road gravel and other construction materials in Phillips and Blaine Counties. Geochemical analyses conducted prior to and during mining by ZMI has shown that this material does not generate acid or release contaminants. It is therefore bound to be an acceptable protective layer for synthetic liners.

**COMMENT:**

4. Why would ZMI be allowed to do the monitoring rather than a state or federal agency? A contractor would be apt to give as favorable a report as possible because of who is paying them, for their services.

**RESPONSE:**

ZMI and their consultants collect water samples and send them to independent laboratories for analysis. The results are then sent directly to the regulatory agencies. The agencies also collect samples to verify the results of this sampling. The fact that the current acid rock drainage conditions were identified through review of data collected by ZMI and their consultants shows that the company does not falsify data. If they were to attempt to do so, it would be revealed by agency sampling.

**COMMENT:**

5. If and when the mine shuts down, will monitoring still take place?

**RESPONSE:**

Post-reclamation monitoring will continue until it is assured that water quality impacts have been remediated and no further impacts will develop. If ZMI were to abandon the operation the agencies would revoke the bond and use it for reclamation, monitoring and water treatment. Current bonding (\$15,000,000) calculations include potential water treatment costs.

**COMMENT:**

6. How long would monitoring continue?

**RESPONSE:**

Post-reclamation monitoring will continue until the data shows that water quality impacts have been remediated and no further impacts will develop. At present the permit requires and is bonded for a minimum 5-year monitoring program.

**COMMENT:**

7. If pollution is found 15-20 years later who will clean it up?

**RESPONSE:**

See the response to comment Nos. 5 and 6. Responsibility for cleanup would depend on the status of the permit and various potentially applicable statutes in place at the time. At present, the operator is liable for long-term site conditions.

**COMMENT:**

8. Is there a bond posted for such a possibility and how much is the bond for?

**RESPONSE:**

Bond is posted for implementation of approved reclamation and closure plans which include water treatment and monitoring. The bond would not be released until these plans have been successfully implemented.

**COMMENT:**

9. Would it cover the cost of additional clean up?

**RESPONSE:**

Bonds are required to be reviewed every five years. In part due to inflation and other uncontrollable factors. Should the cost to perform the clean-up activities increase, the bond would be reviewed and the bond would be adjusted. The bond is calculated to include the costs of "cleanup" until monitoring indicates that "cleanup" efforts have been effective.

**COMMENT:**

10. I still don't entirely understand why mining can't be stopped and clean up begun. If there is not enough material to fill in the holes now, how is there going to be dirt, etc., for fill later?

**RESPONSE:**



The EA addresses reclamation of approved mining. A permit issued under the MMRA may not be revoked unless a failure to comply with enforcement orders of the Department of State Lands can be demonstrated (EA, Page 28). Clean-up activities have begun, and water quality down-gradient of the mine is improving. As mining proceeds, overburden material is now being segregated based upon its total sulfur content, its lithology and its net neutralizing capacity to define its suitability for reclamation material. Previously mined material was placed unsorted into waste rock dumps. Because that material is randomly mixed, it cannot be salvaged for reclamation uses.

**COMMENT:**

11. As far as jobs are concerned, I think such a massive clean up would require just as many workers for a long time.

**RESPONSE:**

Comment noted. (See the response to comment No. 10.)

**COMMENT:**

12. Each time there has been a problem at the mine we have been told it is being taken care of. But the DHES and the Water Quality Bureau sued because of 7 violations of unpermitted discharge into our state's waters. What guarantees do we have that number 8 won't occur?

**RESPONSE:**

Mine disturbances and potential discharges occur within seven drainages. Runoff from these disturbances may (and in some cases does) reach streams. Previously, the company was not informed that discharge permits for these seven locations would be required. The mining company has now applied for the respective discharge permits and is in the process of potentially acquiring the now required discharge permits.

There are no guarantees additional violations would not occur. Mining and reclamation plans are revised in part in order to minimize the potential for significant impacts should a violation occur. That is why the statutes provide for inspection and enforcement programs. Because such permits are now required, violations were issued and the company must obtain the necessary permits.

**COMMENT:**

1. I would like to see Zortman Mining Company's plan for slope grades be approved as I feel they are more practical and will offer excellent protection and tie in better with existing slopes and drainages.

**RESPONSE:**

Slopes of 2.5:1 are the maximum necessary to allow effective placement of compacted clay caps. Slopes must therefore be reduced to an angle of 22° or less to be consistent with the required changes to the reclamation plan.

**COMMENT:**

2. I think the Agencies and Zortman Mining Company may have to compromise on watershed diversion between 6-inch and 7-inch in 24-hour storm events, to be better able to use existing space and materials for construction of diversion's.

**RESPONSE:**

Diversions must be capable of handling large storm events. Review of existing data indicates that storms in which 6 inches of rain fall within 24 hours have a return frequency of approximately 100 years. For certain portions of the mine area, proper functioning of diversion structures is vital so design for larger storm events is necessary.

1. COMMENT:

The Supplemental Environmental Assessment for the Landusky Mine Operating and Reclamation Plan Modifications, prepared by MDSL and BLM, does not provide sufficient factual data to support the conclusions and needs extensive revisions. The agencies' conclusions were that Alternative B would be effective to correct acid drainage problems, prevent acidification of soils, reduce acidification of water and metals to drainages, and "may" alleviate need for future long-term remediation. It would seem very difficult to make any recommendations to correct the ARD problems, with the limited factual data concerning present conditions of surface and groundwater, within and outside of the permit area.

RESPONSE:

The environmental assessment was not intended to function as a "stand-alone" document (See page 5; "Scope of Analysis"). Several other documents and sources of data which were used in the preparation of this EA are referenced (pages 81 to 84 of the EA). Extensive surface and groundwater data exists, and was thoroughly reviewed and referenced in the EA prior to making recommendations to modify the mine plan to control ARD. This detailed data is available for public review. If you wish to review the complete data set, please contact the BLM or DSL offices at 538-7461 or 444-2074, respectively. The EA references annual monitoring reports for 1991 and 1992 (compiled by Hydrometrics, Inc.). In addition, data contained in annual monitoring reports from 1977 through 1990 was also reviewed during preparation of the EA. These data may be accessed nationwide through the STORET database.

2. COMMENT:

For surface water only two sites outside the permit area were reported. These are near Landusky, and both showed sulfate level above the MCL (maximum contaminant level) Standard. No surface water monitoring sites outside the permit area were reported in the King Creek or any other drainage area.

RESPONSE:

The EA indicated that the average sulfate concentration in Mill Gulch above Landusky was 307 mg/L. In Rock Creek above Landusky, the average concentration was stated to be 120 mg/L. Sulfate has a Secondary MCL of 250 mg/L, so both sites did not exceed this level. Secondary MCLs are not enforceable, but are guidelines which indicate whether or not aesthetic qualities (taste, odor, etc) of water may affect its value as a public drinking water supply. The EPA considers water containing less than 10,000 mg/L total dissolved solids (TDS), which includes sulfate, to be suitable for human consumption. No waters affected by the Landusky mine exceed this level. 250 mg/L sulfate is not a surface water standard in the state of Montana.

The other three surface waters proximal to the Landusky Mine are Montana Gulch, King Creek, and South Bighorn Creek. For these creeks, surface water was not discussed because the mine has not impacted water quality in these drainages and/or because no reclamation plan revisions were proposed in these drainages. For your comparison, average 1991-1992 sulfate concentrations in Montana Gulch, King Creek, and South Bighorn Creek (at monitoring sites L-2, L-6, and L-19) were: 354 mg/L, 116 mg/L, and 122 mg/L, respectively. Sulfate loads in Montana Gulch are primarily derived from discharge from the historic Gold Bug Adit.

3. **COMMENT:**

In the Alluvial Groundwater section only one monitoring site, within the permit area, was reported (under the Bedrock Groundwater section). This well showed an increase in sulfate. No alluvial groundwater monitoring sites outside the permit area were reported in the King Creek or any other drainage area. It must be assumed no monitoring took place.

**RESPONSE:**

The referenced site, well ZL-132, is not reported under the summary Bedrock Groundwater section; it is reported under the Sullivan Gulch Groundwater section, which discusses both alluvial and bedrock groundwater monitoring within that drainage. It should not be assumed that no monitoring took place simply because other data from alluvial wells was not reported. There are approximately 40 groundwater monitoring wells associated with the Landusky Mine. Fifteen of these are alluvial wells. Most of these wells are monitored between two and six times annually according to the complete analysis list (refer to Table 5, p. 43 of the EA). In addition, the wells are monitored either weekly or monthly for Operational Analysis parameters.

4. **COMMENT:**

In the Bedrock Groundwater section, within the permit area, data from only four wells were reported. Three of the wells contained arsenic and cadmium concentrations greater than the MCL. Again, no bedrock groundwater monitoring sites outside the permit area were reported in any drainage area. It must be assumed that none took place.

**RESPONSE:**

The EA focused on monitoring in wells which water quality has been impacted and on those wells proximal to mine facilities, where impacts are most likely to be detected. For this reason, details of water quality analyses from outside of the permit boundary were not included. However, this information is available for public review at agency offices or through the EPA's STORET database.

5. **COMMENT:**

It is strongly recommended that more factual data be gathered concerning the present conditions for both surface and groundwater within and outside the permit area. This would result in a much stronger plan for remediation of this area.

**RESPONSE:**

As noted above, much water quality data exists; this data was carefully reviewed prior to preparation of remediation plans. It is not correct to assume that data does not exist merely because it was not presented in the EA. Numerous wells are shown on Figure 10, Page 27, and the text indicates that monitoring is done on a regular basis. Additional data will be presented in the forthcoming Zortman/Landusky EIS. Also, see the response to comment No. 1.

6. **COMMENT:**

It should also be pointed out that under the Wildlife and Fisheries section of Chapter V, the document conveys the message, that should Zortman expansion of mining (1,055 acres)

take place, it would enhance the habitat of big game and upland game birds. There is no documentation which shows this to be a fact at the Landusky mine, nor anywhere else.

**RESPONSE:**

It was not the intent of the EA to convey the message that expansion of the Zortman mine would improve wildlife habitat. The EA did state that wildlife displacement resulting from the potential expansion of the Zortman mine would, in part, be offset by successful reclamation at the nearby Landusky mine and that successful reclamation would improve habitat for the referenced species.

Increases in wildlife use associated with mine areas are often observed at active mine areas, including Montana's Beal Mountain, Golden Sunlight, Landusky, Mineral Hill, and Stillwater mines. At some mines, the populations of wildlife using reclaimed areas have reached nuisance proportions due in part to hunting restrictions on active mine sites and increased forage available on reclaimed slopes between heavily forested areas. Edge effect, in general, is well documented in wildlife literature.

7. **COMMENT:**

The Agency Modified Alternative, discussed in Chapter II, is very difficult to adequately assess due to the lack of information. The alternative should include: (1) Area (acres) and volume (cubic yards, cubic meters) of waste dumps;

**RESPONSE:**

Please refer to other documents referenced in the EA to obtain this information. Some of this information was not pertinent to the issues addressed in this EA, except as already provided in the document. For example Chapter III, page 32, indicated that the Mill Gulch waste rock dump contains approximately 17 million tons of rock. Acreage can be estimated from the maps provided in the EA. For your convenience, the following waste rock dump acreages are provided: #1 August Pit (3.0 acres); #2 August Pit (4.0 acres); Montana Gulch waste rock dump (27.5 acres); Mill Gulch waste rock dump (70 acres).

8. **COMMENT:**

The alternative should include: (2) total estimated sulfur content (lbs, tons);

**RESPONSE:**

The important issue is control of the rate of sulfide oxidation. However, the total sulfur content can be accurately estimated. A recent study of 741 samples of waste rock from the Landusky pits found an average total sulfur content of 0.32 percent (ZMI, 1993a). Ore and waste produced during the earlier years of mining contained less sulfide because the upper portions of the deposit had been oxidized naturally over geologic time. The sulfur content of material mined in previous years is unknown, but probably less than 0.32 percent. For clarification, let us assume that the average total sulfur content of mined rock is 0.32 percent of rock mass and all sulfur is iron sulfide. If this were true, the total mass of sulfur associated with the iron sulfide in the Mill Gulch waste dump would be 54,400 short tons of sulfur. Using the same set of assumptions for the entire mass of mined material, the total sulfur mass would be  $4.8 \times 10^5$  short tons.



9. COMMENT:

The alternative should include: (3) total potential ARD (gallons, acre feet);

RESPONSE:

$7.68 \times 10^8$  moles of pyrite would form  $1.53 \times 10^9$  moles of sulfuric acid. Therefore,  $1.64 \times 10^6$  short tons of sulfuric acid could be produced within the dump, or 19.28 pounds of sulfuric acid per short ton of rock. There are approximately  $1.50 \times 10^8$  short tons of mined materials, either ore or waste, which are already mined, or which will be mined. So a potential mass of sulfuric acid of at least  $1.44 \times 10^8$  short tons could be produced at the mine site. In reality, all sulfur is not sulfide, some sulfide would never react, and some would react slowly over a period of thousands of years. Never would all of the acid be available for transport at any one time.

It is more important to focus on the rate of oxidation rather than the amount of material present for oxidation. The rate of oxidation has been shown to be related to the particle size of the pyrite material and the availability of oxygen. It has been shown (Ritchie et al, 1987 and Harries et al, 1987) that the rate-controlling factor for the oxidation of pyrite is the rate of oxygen transport, either by convection or diffusion.

The critical aspect of the reclamation capping scenario for the agencies' alternative is the successful placement of a clay barrier over the entire facility, be it waste dump, leach pad, dike, or other. This clay barrier, if properly placed and protected, will limit the oxygen transport and decrease the oxidation rate thereby reducing the rate of acid production.

Concurrently, the clay barrier acts as an infiltration barrier as well. Even if all potential sulfuric acid is produced, the transport mechanism, fluid flow through the dump, will be restricted by the clay barrier. Should the topsoil and capillary break material erode away the clay barrier could become compromised. To provide for long-term maintenance ZMI has provided a bond which, at closure, would be transferred into a trust fund. Interest from the trust fund would be used to maintain diversions, caps, water treatment and monitoring if needed, and any other contingencies.

10. COMMENT:

The alternative should include: (4) life expectancy of the geofabric;

RESPONSE:

The geofabric layer to be placed over the PVC liner (refer to EA, page 9) is intended to cushion the PVC liner during placement of overlying caprock. Once the caprock is placed, the geofabric has served its purpose. Its life expectancy is therefore not an issue. In lieu of geofabric, ZMI may use crushed rock or historic tailing material as a protective layer.

11. COMMENT:

The alternative should include: (5) the amount or type of revegetation to be used, if any: In the Soils and Vegetation section on page 50 there is no mention of vegetation except in the title, and the first full sentence on page 51 which mentions "noxious weed control". A complete plan for revegetation should be part of this document.



**RESPONSE:**

The requirement for revegetation is mentioned in the EA (e.g. Table 1 on pages 10 and 11; page 34, ¶ 2; page 16, ¶ 2). Specific species are identified in the operating permit and previously published environmental documents. Refer to pages 29 - 31 and 85 of the 1990 EA for Amendment 10. The current document is a supplement to that document and does not include discussion of aspects of the reclamation plan which have not been modified in response to ARD concerns.

12. **COMMENT:**

The alternative should include: (6) the length of time (years) ZMI will monitor the environment once mining ceases.

**RESPONSE:**

ZMI will be required to continue environmental monitoring for as long as all regulatory agencies with authority in the matter (DSL, BLM, EPA, WQB) deem it necessary to provide long-term protection of the environment.

13. **COMMENT:**

Also, it should include an example of where a similar plan has been successful.

**RESPONSE:**

Please refer to the references section of the document, particularly those of Harries, Ritchie, and SRK. Similar methods have been used at many sites, and such methods are described in textbooks on mine reclamation. One well-documented case is Rum Jungle, Australia, where nearly 10 years of post-reclamation studies have been conducted.

14. **COMMENT:**

In Chapter IV, for the no action alternative, ARD would continue and water quality would continue to be degraded. A statement should be made about the responsibility and liability of ZMI, concerning ARD and the environment, should this alternative be chosen and mining ceased.

**RESPONSE:**

The no action alternative is provided for comparison only. The agencies could not legally select this option. The company is required to meet appropriate water quality standards regardless of the alternative selected.

**COMMENT:**

15. On page i, it is stated: "This reaction...a naturally occurring bacteria." The U.S. Bureau of Mines has conducted research on *ferro bacillus* in coal mining areas in the eastern U.S., and under certain circumstances this bacteria can be reduced, thereby reducing acidity.

**RESPONSE:**

Yes, this is true. The operative words are "under certain circumstances." While some success has been shown in the lab and in pilot scale experimentation, only limited success

has been shown when these methods are applied to field scale projects located in cold climates. Wetlands and lake sediments provide conditions where microbial sulphate reduction and biomineralization occur. These processes can assist in the amelioration of acid rock drainage emerging from pyritic mining wastes. The biological neutralization of mine water however, requires specific conditions that allow anaerobic and aerobic decomposition of organic materials to take place, together with alkalinity generation and sulphate reduction. Cold temperatures experienced during the winter months restrict the effectiveness of this method. That is not to say that wetlands in conjunction with other methods would not be an effective passive measure to take.

**COMMENT:**

16. Page i states: "ARD may ... and are harmful to aquatic life." This should be modified as follows: ARD may ... are harmful or fatal to aquatic life.

**RESPONSE:**

Comment noted.

**COMMENT:**

17. Page ii: "It is the agencies' belief that implementation of the agency modified ....". The word belief probably should be changed to another term which is based on factual data.

**RESPONSE:**

Comment noted. Read "interpretation".

**COMMENT:**

18. Page 3: Neither Mill Gulch nor Sullivan Park leach pads are labeled on maps. All pads should be labeled on maps for clear understanding of the text.

**RESPONSE:**

Comment noted. In other portions of the document, these leach pads are clearly explained to be the 1987 and 1991 leach pads (See page 31). In Figure 2, the '87 and '91 pads are located in Sullivan Creek and Mill Gulch.

**COMMENT:**

19. Page 3, ¶ 4 & 5 state that ARD has not been reduced. Is this in violation of the permit? If this is a violation, it should be so stated, if not, this should also be stated.

**RESPONSE:**

The referenced paragraphs state that ARD has developed. This document reviews proposed efforts to reduce the volume of ARD. Meanwhile, ARD is being collected and used within the mine's processing circuit. This is not a violation of the permit under the Metal Mine Reclamation Act, and the Department of State Lands does not have the authority to pursue violations of the Water Quality Act. This authority resides with the Water Quality Bureau as explained on page 6 of the EA. The MMRA does provide under 82-4-337(3), MCA, that permit modifications can be required in order that ARD be reduced. Reduction of the volume of ARD facilitates water treatment by decreasing the volume of water to be

treated. The 1979 EIS has already required that all water must be diverted or treated in order to prevent water pollution after mine closure and reclamation. ZMI has already provided a bond sufficient to cover the cost of water treatment if necessary.

**COMMENT:**

20. Page 3, ¶ 7: "Contingency ponds .... functioning below problem leach pad underdrains ...." This should be explained. Are they leaking into the groundwater, or surface water, and can they be repaired?

**RESPONSE:**

Some dumps and underdrains are producing and/or discharging acidic water. The contingency ponds and pumpback systems recover some of this water. Proposed mitigations reviewed in this document will help alleviate these conditions. The leach pads are not themselves the problem referred to.

**COMMENT:**

21. Page 22, ¶ 3 states: "Depending on ... sulfide zones, and other factors, ..." Please explain "other factors."

**RESPONSE:**

We apologize for the lack of clarity. The plan is to backfill the pits to a level which allows for surface runoff from the pit areas rather than for discharges to groundwater. This is consistent with the pit reclamation requirements originally described in the 1979 EIS (page 16). This requirement is independent of "final pit configurations, sulfides zones, and other factors".

**COMMENT:**

22. The Agency Modified Alternative should include the life expectancy of the soil cover.

**RESPONSE:**

Soil erosion will be compensated by weathering of the caprock layer and by accumulation of organic matter derived from the vegetative cover. If the soil cover erodes down to the level where the clay cap may become compromised, remediation would be necessary. Reclamation bonding would be used for long-term maintenance of diversions, caps, water treatment, and water monitoring.

**COMMENT:**

23. Page 24: The capping sequence as shown may not be stable from erosion on the proposed 3:1 slopes. Also, the roots from trees, which are the normal vegetation in the area, may penetrate the geofabric.

**RESPONSE:**

Diversions will minimize erosion. The 3:1 slopes are more gradual than most natural slopes in the area. Near-horizontal portions of mine facilities would be covered with not only geofabric but also PVC liners and compacted clay. Occasional root penetrations would have little effect on an infiltration barrier's overall capacity to reduce seepage into facilities.

**COMMENT:**

24. Page 25: Sullivan Park Dike/'91 Leach Pad Contingency Pond should be labelled on the map. The proposed "additional ponds..." should also be shown along with the drainage areas.

**RESPONSE:**

The Contingency Pond is labeled on the map. Please refer to Figure 8, page 19. The additional pond would be constructed immediately downstream of the existing pond. The contingency pond collects drainage from beneath the leach pad and dike. The additional pond would collect drainage from the pad and dike areas.

**COMMENT:**

25. Regarding static testing, page 25, ¶ 3 states: "However, when applying this analytical method to describe the potential for acid production for waste rock or spent ore, the assumption is not always valid because the true availability of the neutralizing minerals can be much less." The estimated true availability of the neutralizing material should be stated, along with the total volume needed for total reclamation.

**RESPONSE:**

There is no way to accurately calculate "true availability" because of the natural variability inherent in field conditions. Because static tests cannot always predict whether waste rock or ore will generate acid, long-term leachate extraction tests, conducted in the field, using run-of-mine materials are now required. In such tests, the rock is not crushed as it is in static (ABA) tests. Therefore, the availability of neutralizing minerals in these tests corresponds with that of actual weathering of ore or waste on a mine site. Rock at Landusky has already proven to be acid-generating. Therefore the approach toward reclamation has been modified to accommodate for that fact.

**COMMENT:**

26. Page 26, ¶ 5 requires: "...a bedrock monitoring well in Montana Gulch below the '85/86 leach pad contingency pond, and two wells...at the head of King Creek..." The "pond" and "Kings Creek" should be shown on the map on page 27. The numbers of the "two wells" should be stated.

**RESPONSE:**

Both the pond and King Creek are shown on the indicated map. The pond is a rectangular feature oriented parallel to the Montana Gulch drainage, marked with a "w" (for water), and is located immediately down-gradient of the 1985/1986 leach pad's dike. King Creek is northwest of the Queen Rose pit, and contains surface water monitoring sites L-5, L-6, and L-39, as well as monitoring wells ZL-139 and ZL-140. King Creek is labeled on Figures 2 and 13. The numbers of the "two wells" is not stated because they are proposed wells. They do not yet exist, so they have not received numbers.

**COMMENT:**

27. Page 27: For a better understanding of the 1993 Facilities and Water Resources Monitoring Map a figure number (10) should be included.

**RESPONSE:**

We apologize for the oversight.

**COMMENT:**

28. Streams should be labelled as referred to in the text.

**RESPONSE:**

Stream names are provided on Figures 2 and 13.

**COMMENT:**

29. Pads should be labelled by name.

**RESPONSE:**

The leach pads are labeled by their official names (by the date they were constructed). These ore heaps are sometimes also referred to by the drainage in which they are situated (refer to Page 31 and Figure 2).

**COMMENT:**

30. Present and proposed contingency ponds should be shown and labelled.

**RESPONSE:**

All existing ponds are shown on the map, and are labeled with "w"'s. The scale of the map does not permit further detail. Contingency ponds are located below each leach pad's dike.

**COMMENT:**

31. Dikes should be labelled.

**RESPONSE:**

Please note that all dikes are shown on the map, and are drafted with a distinct pattern which is explained in the figure's key. The Sullivan Park Dike is adjacent to the Sullivan Park Leach Pad, etc.

**COMMENT:**

32. Size of print on contours should be enlarged, as it is difficult or impossible to read without magnification.

**RESPONSE:**

Most of the contour labels are legible. With that information, the correct elevations of other contours, which are either unlabeled or illegible, can be determined.

**COMMENT:**

33. Have the proposed methods in the Agency Modified Alternative section been used successfully elsewhere?

**RESPONSE:**

The proposed methods have been used elsewhere. Similar capping sequences are described in textbooks on mine waste management.

**COMMENT:**

34. If so, where?

**RESPONSE:**

An extensive literature search was conducted specifically to address this question. The EA references studies performed at Rum Jungle in Australia (pp. 53 & 54). This case study was used for illustration because methods were well described and results were field validated. Methods are also discussed in SRK, 1992.

**COMMENT:**

35. If not, this should also be stated.

**RESPONSE:**

Although these techniques are relatively new to the mining industry, similar capping requirements exist for public landfills and hazardous waste disposal sites. See RCRA/CERCLA requirements. These capping methods are most effective at isolating wastes from the environment.

**COMMENT:**

36. Page 28: Under State and Federal statutes, isn't ZMI responsible for the water quality whether or not the mine is operating?

**RESPONSE:**

That is correct.

**COMMENT:**

37. Why would stopping mining result in "additional damage to the environment"?

**RESPONSE:**

If mining activities were suspended, it would prolong the period during which acid mine drainage would continue. If the site were not reclaimed, weathering of exposed rock would result in exacerbated acid rock drainage. The company would be responsible for treating this water; however, only proper reclamation (as addressed in this EA) can reduce the amount of water which may require treatment. As discussed in this EA, a geochemically neutral material, available only through mining somewhere, is needed for reclamation.



Stopping mining at the permit site would result in delays in mitigation efforts until an alternate source could be proposed, evaluated in an EA or EIS, and developed.

**COMMENT:**

38. "Loss of over 200 jobs" could be interpreted to mean that the "Agencies" may be advocating short term economic gains, rather than a long-term (100 years or more) environmental benefit.

**RESPONSE:**

Until 1993, mining at Landusky was done without mitigations to reduce, control, or prevent ARD. Continued mining can be done in such a way as to segregate acid-producing rock and isolate previously mined acid-generating materials from the elements. Because the problems have already developed and need to be corrected, the agencies determined that immediate mine closure would not have beneficial effects. The loss of jobs is one of several effects listed and does not represent an agency advocacy of either short-term economic gains or long-term effects.

**COMMENT:**

39. Permits can be revoked if a mine fails to comply with enforcement orders. The EA indicates that ZMI has received noncompliances. Did ZMI fail to comply with enforcement orders?

**RESPONSE:**

Noncompliances are issued when a company appears to have diverged from an approved mining plan. The referenced noncompliances are in fact the enforcement orders. ZMI is complying with those orders by proposing a revised reclamation plan which has been evaluated in this EA and which will be incorporated into an EIS which evaluates a comprehensive plan.

**COMMENT:**

40. Page 29, last sentence, states, "Corrective actions implemented concurrent with mining would have more beneficial environmental effects than immediate mine closure would." This statement should be further explained. If ZMI is responsible for reclamation, why would continued mining be more "beneficial" to the environment?

**RESPONSE:**

In order for reclamation to be most effective, more material must be moved in order to create topography which lends itself to controlling runoff. This can be done through mining. Also, a stockpile of neutral rock for reclamation capping will be produced. This is done through waste segregation. Rather than continuing gold mining, neutral rock could be produced directly by creating expansive new limestone mines elsewhere in the Little Rocky Mountains. The agencies have determined that obtaining the required neutral material from existing pits via segregation of rock already permitted to be mined is environmentally preferable to the creation of new pits and haul roads solely for the purpose of obtaining limestone.

**COMMENT:**

41. Page 31, second sentence: The term "aquatic life" should be included in the list.

**RESPONSE:**

Comment noted.

**COMMENT:**

42. Page 31, ¶ 3 refers to "Leach .... chenbonitic shale." Is this a type of bentonitic material?

**RESPONSE:**

Your assumption is correct. Before a word processing error, the text read "bentonitic clay shale".

**COMMENT:**

43. The table at the bottom of page 31 should include the area (acres) of each pad.

**RESPONSE:**

You may estimate the acreage from the maps provided. For your convenience, the acreages are: 5.0 (1979); 25.5 (1980-82); 22.0 (1983); 13.5 (1984); 55.5 (1985-86); 82.0 (1987); 78.5 (1991). The acreage for the 85/86 pad includes the Montana Gulch extension which would not be constructed under Alternative B. This involves approximately 33 acres. Disturbance of approximately 25 acres adjacent to the Mill Gulch and Sullivan Park leach pads would be substituted for this omission from Montana Gulch.

**COMMENT:**

44. Page 32 describes a drain constructed prior to resloping of the Mill Gulch dump. "This design allowed unimpacted springs...to...pass beneath the contingency pond without being impacted by acidic seepage." Is this additional drain functioning as designed?

**RESPONSE:**

Yes it is. Surface water below this new drain is monitored at site L-36, which is described on page 46 of the EA.

**COMMENT:**

45. Page 34: Elevation 4740 is not shown on the map, and it is very difficult to read the elevations of many of the contours.

**RESPONSE:**

Please refer to Figure 11, page 35. Most contour labels are legible, and elevation 4740 is shown by the shaded pattern. Note the "4740 barrier layer" described in the map's key.

**COMMENT:**

46. Page 36, Figure 12: The small geologic cross section at the bottom of the page should have a legend.

**RESPONSE:**

Comment noted. As written on the cross section, the core of the mountain range is composed of porphyry and schist. The overlying layers of rock correspond with the Pre-Mesozoic and Mesozoic rocks described in the key of the geologic map on this page.

**COMMENT:**

47. Page 39: Could large precipitation events that move coarse gravel downstream also move mine material off 3:1 slopes into the streams?

**RESPONSE:**

Erosion could occur off 3:1 slopes during large precipitation events. However, it would occur at a vastly different scale than movement of coarse gravels in streams. This is because the quantity and force of the water in the two locations (slopes and stream channels) would be vastly different. The deposition of eroded sediments would depend on topography and vegetation. Some sediments from 3:1 slopes may reach streams. For comparison, natural slopes are steeper and more erosive than the constructed slopes. Also, constructed slopes will have engineered diversions designed to prevent mass wasting of these slopes.

**COMMENT:**

48. Some site numbers printed on Figure 13 are nearly impossible to read even when magnified.

**RESPONSE:**

The purpose of Figure 13 is to show the locations of drainages, not to indicate the site numbers of monitoring locations. Refer to Figure 10 for the desired information.

**COMMENT:**

49. Page 41, ¶ 2, states "There is no discharge to surface waters..." (from the Sullivan contingency pond). Could there be discharge to groundwater?

**RESPONSE:**

Refer to pages 49 and 56, which explain (under the groundwater sections) that the pond does not capture all groundwater. Although the pond does not discharge, acidic water currently passes beneath this pond, and is recovered at site L-27.

**COMMENT:**

50. Page 43, Table 5: This table should include a list of MCL standards.

**RESPONSE:**

Information on water quality standards is available from the EPA and from the Montana Department of Health and Environmental Sciences' (MDHES) Water Quality Bureau. The purpose of the table is to indicate what parameters are monitored. Not all monitored parameters have MCLs. Primary Maximum Contaminant Levels (MCL's) are assigned to chemicals or elements which may have toxic or carcinogenic effects above certain concentrations, and establish limits for these parameters in drinking water supply systems which serve communities. For Table 5, the MCLs (in milligrams per liter) would be: nitrate (10.0);

arsenic (0.05); cadmium (0.01); chromium (0.1); copper (1.3); lead (0.05); mercury (0.00-2); nickel (0.1); selenium (0.05); and silver (0.05).

**COMMENT:**

51. The footnote to Table 5 refers the reader to Appendix A for a discussion of analytical techniques and detection limits. This document contains neither an Appendix A nor such a discussion.

**RESPONSE:**

Table 5 was copied from the reference "Hydrometrics, 1993a." The reference to appendix A should be struck.

**COMMENT:**

52. Page 45, ¶ 2 states "Any water which collects in the pits infiltrates into groundwaters." Is this being monitored? If not, what are the estimates of ARD entering into groundwater system?

**RESPONSE:**

During previous underground mining operations, a drainage tunnel was driven to route groundwater away from the mine workings. Most water which infiltrates into the pit areas discharges from this adit into Montana Gulch. The adit discharge monitoring site is known as L-3. The pH and metals content of this discharge remains similar to its quality prior to the initiation of open-pit mining. A monitoring well has been placed near the northwest edge of the Queen Rose pit (well 91-LH-3 is shown on Figure 10), and does not show signs of acid or metals migration to the northwest from the pits.

**COMMENT:**

53. Page 46 or 47: A table of pH monitoring results should be included for a better understanding of surface water conditions.

**RESPONSE:**

The text explains where acid drainage is occurring. Due to the natural buffering capacities of some rock types, other parameters such as sulfate concentration are more sensitive indicators of ARD than pH is.

**COMMENT:**

54. Page 46, ¶ 3: Concentrations of cadmium and nitrate are stated to occasionally exceed MCLs in upper Mill Gulch. The term "occasionally" needs to be defined. Does this mean once a year, or once a week, etc.?

**RESPONSE:**

At site L-26 (the old collection pond) nitrate exceeded the MCL during 66 percent of 1991/-1992 sampling events, and cadmium exceeded the MCL (10 mg/L) during all sampling events of this period. At L-25, nitrate did not exceed the MCL during this period, but cadmium exceeded the MCL during 40 percent of sampling events.

**COMMENT:**

55. The stream at site L-35 is indicated to be often dry. Could the cadmium and other materials be stored in the stream bed to be released at higher flows?

**RESPONSE:**

Site L-35 is not on a stream; it is within the constructed drain which reports to the Mill Gulch seepage collection and recovery pond. During higher flows, any "stored" cadmium could be released. If it were released, it would be captured in the collection pond

**COMMENT:**

56. The text on page 46 states "In summary, impacts to these sites were localized." Table 6 showed that sulfate (307) mg/L) exceeded the standard at site L-7 located near the confluence with Rock Creek.

**RESPONSE:**

Comment noted. Sulfate concentrations have risen throughout Mill Gulch Creek's one mile length. These sulfate levels poses no health risk. It is often discussed in the EA because sulfate derived from the oxidation of sulfide minerals is the first indicator of the sulfide oxidation reaction which can cause acid rock drainage. Where buffering capacities are adequate, it may be the only detectable product of sulfide oxidation in solution. The 250 mg/L "standard" for sulfate is not enforceable, and does not pertain to surface waters. It is a suggested limit for water supplies which function as drinking water for large communities (i.e. 50,000 or more people). Water containing less than 10,000 mg/L dissolved solids (sulfate included) is considered safe to drink, provided no primary MCLs are exceeded.

**COMMENT:**

57. No mention is made in the text concerning the results of monitoring of King Creek or any other drainages which potentially will be affected by mining in this area. Figure 13 shows monitoring sites on both King Creek and Carter Gulch. Monitoring results, if they are available, for these drainages should be included in the text.

**RESPONSE:**

Surface water in Carter Gulch has been impacted by the Zortman mine, rather than the Landusky mine, and that contaminated water is being diverted for use in ore processing. Impacts to Carter Gulch will be discussed in the EIS for the Zortman mine expansion.

In King Creek, monitoring site L-5 is an ephemeral seep which is dry during most monitoring events. It flows through a 1930s-era tailings deposit. At this site, the pH remains neutral to alkaline and most metals remain below detection limits. Only the MCL for nitrate has been exceeded. This is probably related to fertilization of adjacent reclaimed areas, such as the old tailings and the August Pit waste rock dumps. At L-5, sulfate concentrations have increased from 134 mg/L in 1978 to an average of 563 mg/L in 1991. The site was dry during all sampling events in 1990 and 1992. The sulfate may be derived from waste rock placed at the head of the drainage when open-pit mining began in the late 1970s. As previously noted, Carter Gulch contains a waste rock dump associated with the Zortman mine, which is not the topic of this Environmental Assessment. This EA reviews proposed changes to reclamation plans for Landusky mine facilities located in Mill Gulch and Sullivan Gulch.



These are the potentially affected drainages, and the text does mention results of groundwater monitoring in these drainages.

You have requested information on groundwater monitoring in the King Creek drainage. Wells ZL-139 (granitic bedrock) and ZL-140 (tailings  $\pm$  alluvium) were installed in this drainage in September of 1990. Groundwater from ZL-139 has neutral pH, low to nondetectable concentrations of dissolved metals, and sulfate concentrations between 292 and 640 mg/L. The lower concentrations occur during the spring when the groundwater is recharged by snowmelt and higher precipitation. Well ZL-140 is typically dry. In 1991 water was recovered from this well during three sampling events (May, June, July). This water had an alkaline pH, low metals concentrations, and sulfate concentrations of 190 to 283 mg/L.

**COMMENT:**

58. Page 47: The Alluvial Groundwater section contains only general information about areas surrounding the Little Rocky Mountains. No well sites are mentioned pertaining to mining. One site (ZL-132) only is mentioned on page 50 under the Bedrock Groundwater section. This well showed an increase in sulfate concentration. Was the increase in excess of the MCL? Alluvial groundwater monitoring should be an integral part of the entire monitoring system.

**RESPONSE:**

As noted earlier, there are approximately 15 alluvial monitoring wells both within and outside of the mine's permit boundary. They are routinely monitored, and are an integral part of the monitoring system. Please note that alluvial well ZL-132 is not discussed in the summary Bedrock Groundwater section, but rather in a following section which describes both alluvial and bedrock groundwater specific to Sullivan Gulch. The discussion is appropriately placed. Between 1990 and 1992, sulfate concentrations at ZL-132 increased from 71 mg/L to 1180 mg/L.

**COMMENT:**

59. Page 50: For better understanding, bedrock groundwater monitoring results should be depicted in table form.

**RESPONSE:**

It was not the agencies' intent to provide a comprehensive tabulation of existing data in this EA. More detailed information on the extensive groundwater quality database will be provided in a forthcoming EIS which will evaluate both a proposed expansion of the Zortman mine and final closure requirements for the Landusky mine. In addition, monitoring reports are on file and available for public review. (See response No. 1.)

**COMMENT:**

60. Page 50: Only four bedrock wells ZL-128, ZL-129, ZL-130 (sampled between 1988 and 1992), and ZL-131 (sampling dates not reported) were reported. Three of these wells contained "arsenic in excess of the MCL," and one showed cadmium "greater than the MCL."



**RESPONSE:**

Wells ZL-128, ZL-129, and ZL-130 were drilled into a mineralized area; the rock surrounding these wells contains iron sulfides and oxides. Arsenic and cadmium are likely native to these rocks. Because water quality in wells ZL-129 and ZL-130 has remained unchanged, while well ZL-128 (which is not as deep as the others) has been impacted by drainage from the waste rock dump (as explained in the EA), the metals levels in these wells are not considered to be related to mining activity but to mineralogy present in the interval sampled. Water quality trends at ZL-128 resemble those from nearby surface water monitoring sites. ZL-131 has been monitored since installation in November 1990. No MCL's have been exceeded at this monitoring point.

**COMMENT:**

61. Is anything being done to clean up this pollution? If not, will these materials move into streams further downslope? Could they move into domestic wells?

**RESPONSE:**

This EA describes solution capture and source control measures being implemented to control impacts from acid rock drainage. These activities are being performed in order to clean up mining-related pollution and prevent further pollution. A future EIS will evaluate the need for long-term water treatment. The combination of source controls and effective effluent capture systems will prevent down-gradient migration of contaminants.

**COMMENT:**

62. The statement is made that "these metals concentrations are most likely characteristic of premining water quality." Is there factual evidence to support this statement?

**RESPONSE:**

Yes. (See the response to comment No. 58.)

**COMMENT:**

63. The EA states, "If waste rock...were the source of these metals then concentrations would have increased with time." The data presented does not show that they did not increase with time. If such data exists it should be included in the report.

**RESPONSE:**

The statements in the EA summarize the existing data for these wells. It should be noted that the agencies consider these data to be an unusual case. Most monitoring wells near the Landusky mine are not completed within mineralized syenite porphyry bedrock and therefore did not initially contain high metals levels. Metals concentrations in most monitoring wells remain low; however, where data show trends of increasing metals or sulfate concentrations this degradation is assumed to be the result of mining activity. An example is alluvial monitoring well ZL-132, which was completed in November of 1990 (prior to construction of the up-gradient 1991 leach pad and dike). Monitoring began at that time and has continued until present. Trends of increasing metals (Al, Cd, Cu, Fe, Mn, Ni, Zn) and sulfate are evident from review of the data.

**COMMENT:**

64. Without establishing vegetation on soil materials recommended for reclamation, erosion will occur rapidly on the proposed 3:1 slopes, resulting downslope sedimentation. ZMI or the agencies probably should contact the USDA, Soil Conservation Service in Blaine County to get assistance in developing such a plan.

**RESPONSE:**

Rapid revegetation with a seed mix consisting mostly of native grasses and forbs is required under the existing reclamation plan. This plan was developed using information collected over a period of many years by many agencies, including the USDA. No modifications to the previously approved mix have been proposed or are recommended. In addition, planting of native trees and shrubs is required. The requirement for revegetation is noted in several portions of the document; Table 1 - Summary of Approved and Proposed Plans.

**COMMENT:**

65. Page 54 of the EA states "Moving the Montana Gulch leach pad would limit the development of ARD..." The term "would limit" should be quantified.

**RESPONSE:**

Montana Gulch has been impacted by discharge from the Gold Bug Adit since long before open-pit mining began. Surface water down-gradient of ZMI's facilities in Montana Gulch is not acidic. The preferred plan is to not expand the existing leach pad in Montana Gulch. Therefore, no new potential sources of ARD would be placed in this drainage, and the potential for development of ARD in this drainage would be limited to the disturbances which already exist within Montana Gulch.

**COMMENT:**

66. On Page 58 of the EA, it is stated "Flows...during storm events...discharges directly to the creeks." The storm event which allows this to happen should be stated, i.e. the 100-year event.

**RESPONSE:**

The document refers to watershed diversions (Figures 3, 6, and 7) which route runoff away from acid-generating material, then return the water to natural drainage courses downgradient. These discharges are supposed to happen to discharge unimpacted water to the creeks. The minimum design criterion for these facilities is a 10-year, 24-hour storm event.

**COMMENT:**

67. Also, it should be stated whether these "flows" have an impact on the aquatic life.

**RESPONSE:**

Because the flows in question are waters diverted from undisturbed or fully reclaimed areas, there would be no water contamination or impact on aquatic life. Rock Creek and its tributaries are intermittent above the confluence with Montana Gulch.

**COMMENT:**

68. On page 58, the EA states "Mixing of this seepage with unimpacted seeps and with diverted runoff would dilute any residual acidity." If this is planned as part of the reclamation, it should be so stated.

**RESPONSE:**

This would be the result if water treatment did not occur. However, DSL has bonded ZMI for water treatment, and the need for such treatment will be determined by the Montana Water Quality Bureau and then analyzed in the upcoming EIS.

**COMMENT:**

69. Page 59, the text should be modified to read: "additional required monitoring would provide added assurance that reclamation has accomplished the goal of meeting State and Federal standards of water quality."

**RESPONSE:**

Comment noted. ZMI will be required to meet whatever standards are imposed by WQB/EPA.

**COMMENT:**

70. Page 59 states "Moving the Montana Gulch leach pad...would eliminate the likelihood of seepage to groundwater." The term "likelihood" should be further explained. Is it based on observed data or an opinion? Also, this is not mentioned on page 25, which deals with this leach pad.

**RESPONSE:**

The discussion is based on probability of impact. ZMI has been permitted to expand the leach pad up Montana Gulch, but construction has not yet begun. Therefore, no impacts have occurred. Because the leach pad was to be constructed in a drainage, the likelihood of contamination occurring would be greater than if the ore is placed on and between existing leach pads located between Mill Gulch and Sullivan Park.

**COMMENT:**

71. When will final reclamation occur?

**RESPONSE:**

At current mining rates, Sullivan Park and Montana Gulch would be completely loaded by the end of 1995. Unless ZMI were to propose and receive approval for additional mining at Landusky, final reclamation of waste rock dumps and pits would begin in 1996. Leach pads would be reclaimed after gold recovery is completed and the cyanide solution has been neutralized. This would require at least 5 years. Therefore, the Sullivan Park leach pad would not be reclaimed prior to 2001. Actual date of reclamation would depend on when ZMI succeeds in reducing cyanide levels in the leach pad to the stipulated level, 0.22 mg/L WAD cyanide.

COMMENT:

72. The last two paragraphs on page 59 use the term "residual seepage" which should be defined. These two paragraphs also state that ARD will not affect beneficial use of groundwater. Is this an assumption? There do not seem to be factual data to back up the statement.

RESPONSE:

Residual seepage would be any water which infiltrates into facilities despite diversions, infiltration barriers, and revegetation. Seepage through the proposed capping system has been modeled; the proposed cap should achieve greater than 95 percent reduction of infiltration. These two paragraphs of the EA also state that groundwater would continue to be monitored after reclamation, and that treatment and/or additional source control measures would be required if monitoring indicated that water quality impacts either persisted or developed after reclamation. It is the contingency for water treatment which assures that beneficial uses will not be affected.

COMMENT:

73. The second paragraph on page 60 states "Capping of the Sullivan Park Dike may cut off recharge to the acid-generating material which is causing some of the acid rock drainage below this facility." This statement is not backed up on pages 26, concerning the Agency Modified Alternative, or on page 34, concerning the Sullivan Park dike. The term "may cut off" seems speculative at best. It does not seem to be based on factual data. This should be explained.

RESPONSE:

The discussion on page 26 relates to what is proposed, not its effectiveness. Page 34 explains that besides the known ARD source, dike fill material, the pad foundation and underdrains may contribute acid drainage as well. Prior to leach pad construction, a spring (<1 gpm) was documented in the foundation area. We can only speculate whether this spring still discharges or whether all discharge from the underdrain results from infiltration through the leach pad's dike. That the dike is a source of acid drainage is proven by observations of steam venting from the dike during cold weather. This steam results from the exothermic sulfide oxidation reaction driven by water and oxygen infiltrating through the revegetated dike and contacting sulfide waste rock within the dike. If capping of the dike does not stop the acidic seepage completely, water treatment may be necessary.

COMMENT:

74. If State and Federal Water Quality Standards are not being met, can there be a No Action Alternative?

RESPONSE:

No, there can not. The no action alternative was presented for comparison purposes to the mining and reclamation plans as approved February 28, 1991.

COMMENT:

75. On page 60 of the EA it is stated that "Because the streams must first flow over outcrops of carbonate rock...the water pH would be neutralized and most dissolved metals would

precipitate prior to reaching outcrops of bedrock aquifers." From the data presented in this EA this statement is not correct. The groundwater monitoring (four wells) shows (page 50) that bedrock groundwater has been polluted with arsenic and cadmium.

**RESPONSE:**

The referenced portion of the EA pertains to the no action alternative, which, as you previously indicated, cannot be selected. Even if perpetual water treatment is required, the source controls discussed in this document must be instituted to reduce the volume of water which would require treatment.

With regard to the specific monitoring wells to which you refer, these wells are not completed in the bedrock aquifers discussed in the document. Of the five wells discussed on page 50, three were completed in mineralized syenite porphyry (volcanic) rock in Mill Gulch. Baseline water quality for these wells indicate that groundwater in this zone either contains naturally high levels of arsenic and cadmium or that the act of drilling the wells released these metals from the mineralized rock. Only one of these three wells has shown changes in water quality related to mining. The other two of the five wells are below the Sullivan Park leach pad. Water monitored by the alluvial well (ZL-132) has been degraded by acidic discharge from the leach pad/dike underdrain. The bedrock well (ZL-131) is completed in unmineralized syenite porphyry bedrock and does not contain elevated metals concentrations. All of these wells are located up-gradient of the carbonate bedrock units and the regional bedrock aquifers.

The wells described on page 50 are not meant to be representative of regional groundwater quality. They are discussed under sections of the document which are specific to Mill Gulch and to Sullivan Gulch. They are located within the porphyritic intrusive core of the mountain range (see map and cross section, Figure 12 of EA) rather than within the sedimentary rock aquifers which surround the mountain range. The porphyry bedrock does contain groundwater, particularly within faults or fracture zones (Feltis, 1983). Otherwise, yields are typically too low for this unit to function as an aquifer.

**COMMENT:**

76. Also, from the information presented, it has not been shown that the "carbonate rock" will neutralize the ARD. See page 25, 3rd para., last sentence concerning neutralizing rock states, "However, ...the assumption is not always valid because the true availability of the neutralizing minerals can be much less."

**RESPONSE:**

Monitoring data indicates that to date, water does not remain acidic after passing over outcrops of carbonate rock. The water reaches outcrops of bedrock units which are used as drinking water supplies only after flowing over these carbonate units. If the no action alternative were selected and current conditions persisted into the future, the discussion in the EA would be appropriate. The "polluted wells" to which you referred are located up-gradient of these units; water sampled by those wells has not interacted with carbonate rock.

It is not appropriate to contrast this with the statements on page 25. The statements on page 60 about neutralization of acidic water by carbonate rock units are based on actual field observation. The agencies are not relying on these current conditions as guarantees that future water quality impacts would remain confined to areas of syenite porphyry bedrock; therefore, the no action alternative is not acceptable. In contrast, the statements on



page 25 refer to Acid-Base Accounting tests of mine waste rock. These tests predict whether or not a rock will be acid-producing by pulverizing the rock, then comparing the rock's total acid-producing potential to its total neutralizing potential. This is an inappropriate test for waste rock because most sulfide minerals are contained on fractures and rock surfaces and are available for weathering, but most of the neutralizing minerals are within the rock and are not available for reaction. However, it is used because it is an accepted indicator in the scientific community. The ABA method is particularly useful for predicting the behavior of tailings.

**COMMENT:**

77. On page 60, the EA states "Recent storm events demonstrate that not all existing diversions are adequate to handle runoff from major storm events. Failure...could result in transport of sediment and acid-generating rock into drainages below Landusky mine facilities." Will the diversions be upgraded to handle the runoff?

**RESPONSE:**

Yes. That is a stated purpose of the corrective actions reviewed by the EA. (See pages 27 and 41.)

**COMMENT:**

78. Page 61 of the EA indicates "Precipitation falling into pits could infiltrate through potentially acid-producing materials. If this occurred, the potential to contribute acids and metals to groundwater exists." According to the information presented, infiltration through these materials is occurring at present.

**RESPONSE:**

That is correct. The no action alternative would allow that to continue after reclamation. This EA discusses alternate reclamation scenarios which would mitigate potential groundwater contamination associated with pits.

**COMMENT:**

79. On page 61, the EA states that if the no action alternative is selected, the Mill Gulch waste rock dump would still be reclaimed in a manner which would reduce, but may not prevent, acid rock drainage. Does that mean that ZMI would not have to meet State and Federal Standards under the no action alternative?

**RESPONSE:**

No it does not. ZMI would be required to protect water quality regardless of the alternative selected. Water treatment, if necessary, is required by the original EIS for the Landusky mine. However, without adequate source controls, it may be impossible to capture and treat some of the degraded water.

**COMMENT:**

80. On page 65, the EA states "The fishery in Rock Creek would not likely be contaminated by acidified waters." This is a subjective statement that has not been demonstrated by the EA.

**RESPONSE:**

The EA indicates that to date, only sulfate concentrations have increased in Rock Creek below Landusky. Acid conditions only exist in the headwaters of drainages, near mine disturbances. Due to the intermittent nature of Rock Creek in and above Landusky, there is no fishery in that area. Thus, the changes in water quality are not a threat to fish populations. Under Alternative B, enhanced reclamation practices would reduce water quality impacts from current levels and maintenance of pumpback and treatment facilities would prevent downstream impacts.

**COMMENT:**

81. On page 69, it is stated that any soil shortages at the Zortman mine could be compensated by:

(1.) Excess soil after reclamation of Landusky disturbances. From the information presented, there will be no excess.

**RESPONSE:**

Refer to page 65, ¶ 1. Current soil stockpiles at the Landusky mine contain enough soil to reclaim all disturbances at the mine with 17 to 18 inches of soil. This exceeds the required replacement depth of 12 inches. Excess soil could be used at the Zortman mine, if necessary.

**COMMENT:**

82. (2.) Excess blue waste (neutral waste rock) from Landusky. An estimate of the volume probably should be included.

**RESPONSE:**

The amount of excess neutral waste rock from Landusky, if any, cannot accurately be estimated before it is mined. For this reason, the EA lists six possible sources of additional reclamation materials.

**COMMENT:**

83. (3.) Miscellaneous acres left to disturb for diversion, road, or other construction at Zortman. The term "acres left to disturb" should be explained and an estimated volume should be included. Items 4, 5, and 6 should also include estimated volumes.

**RESPONSE:**

No revised reclamation plan for the Zortman mine has yet been developed, so no volume/acreage estimates are available at this time. Reclamation of the Zortman mine will be discussed in the Zortman Mine Expansion EIS. Although the EA indicates that material from Landusky could be used for reclamation at the Zortman mine, reclamation of the Zortman mine is not dependent upon use of material from Landusky.

**COMMENT:**

84. Page 70 of the EA states "Cumulative effects to fisheries would not occur because the affected streams at Landusky above Rock Creek are ephemeral and do not support fisher-



ies." A statement should be made concerning the fishery in Rock Creek. Monitoring site L-7, located very near the confluence of Mill Gulch and Rock Creek, show sulfate levels above the MCL standard. Could the fishery in Rock Creek be effected at present by sulfate levels above the MCL Standard?

**RESPONSE:**

The 250 mg/L sulfate level is not a primary MCL, and is not related to impact on aquatic life. Rock Creek is not a fishery either near the confluence with Mill Gulch or near the town of Landusky. It becomes a fishery downstream of the lowest monitoring site, L-1. Monitoring data reveal that chronic aquatic life criteria have not been exceeded at site L-1, so there has never been any threat to the fishery.

**COMMENT:**

85. Could the fishery in King Creek be effected at present?

**RESPONSE:**

King Creek does not become a fishery until downstream of monitoring station L-6 (near the beaver ponds). Monitoring data reveal that chronic aquatic life criteria have not been exceeded at L-6. Therefore, the fishery in King Creek has not been threatened by impacts from ZMI's operation.

**COMMENT:**

86. There were no monitoring sites reported at Landusky, nor in King Creek.

**RESPONSE:**

It was not necessary to present data from all monitoring sites in the EA. The scope of the EA is presented on pages 1 and 5 and only pertinent monitoring data were reinforced and summarized. All other data are on file and available for review. Additional information concerning King Creek and Rock Creek (both above and below Landusky) has been provided in these responses to comments.

**COMMENT:**

87. The statement on page 70 that "cumulative effects to wildlife are likely to be limited" has little meaning and needs to be explained.

**RESPONSE:**

The statement is explained in the sentences which follow it in the EA.

**COMMENT:**

88. Also, on page 70, it is stated "Overall, loss of timbered acreage (through mining) increases edge effect and increases forage available, enhancing big game and upland game birds." In effect, this statement conveys the message that the 1,055 acres which may be mined near Zortman, (similar to that taking place at the Landusky site), is good for wildlife habitat. Has this been demonstrated at the Landusky site? Has this been demonstrated elsewhere?

**RESPONSE:**

The discussion on page 70 concerns post-reclamation conditions. The EA indicated that temporary loss of wildlife habitat due to the proposed disturbance of 1,055 acres at the Zortman mine would, in part, be offset by restoration of mined lands at the Landusky mine. The statements regarding edge effects and available forage refer to the beneficial effects to big game and upland game bird habitat of having a mixture of forested areas and grassy slopes versus solely forested areas.

**COMMENT:**

89. Has this been demonstrated elsewhere?

**RESPONSE:**

Increases in wildlife use associated with mine areas are often observed at active mine areas, including Montana's Beal Mountain, Golden Sunlight, Landusky, Mineral Hill, and Stillwater mines. At some mines, the populations of wildlife using reclaimed areas have reached nuisance proportions due in part to hunting restrictions on active mine sites and increased forage available on reclaimed slopes between heavily forested areas. Edge effect, in general, is well documented in wildlife literature.

**COMMENT:**

90. The first paragraph of page 71 states "The selection of this alternative (Alternative B) may alleviate the need for future long-term remediation." This statement needs to be strengthened. The term "may alleviate" could be construed to mean that Alternative B is a trial method and is not based on experience or a proven method.

**RESPONSE:**

The method has been proven effective at other sites, such as Rum Jungle, Australia. However, each mine site's climate, geology, and hydrologic regime are somewhat unique. Furthermore the standards vary from state to state and country to country. The quoted statement could be revised as follows: Alternative B will reduce the volume of water which requires treatment prior to discharge, and may eliminate the need for water treatment altogether.

**COMMENT:**

91. According to page 71, "Three new wells would be constructed..." The locations of these wells need to be shown.

**RESPONSE:**

The general locations are described. Exact locations cannot be shown on a map until the wells are completed.

**COMMENT:**

92. According to page 72, "If the measures...are adopted, the long-term potential for ARD problems is substantially reduced and would likely be prevented." The terms "substantially reduced" and "would likely" are nebulous and subjective terms which need to be quantified.

**RESPONSE:**

With regard to predictions of future conditions, there is always a level of uncertainty. Contingency actions are provided for, should predictions prove to be inaccurate. Substantial reductions in volume of acid discharges due to diversion of runoff and restriction of infiltration are expected to be within the range of at least 83 to 90 percent. Even soil and revegetation alone, without clay capping would likely achieve these levels. With capping, infiltration would more likely be reduced by 95 to 99 percent, as was modelled by Schefer and Associates (1993) for the "Zortman Mine Alternations Document."

**COMMENT:**

93. Contingency ponds need to be included under the Engineering section on page 72.

**RESPONSE:**

Comment Noted.

**COMMENT:**

94. Page 73 (or elsewhere in the document) should include: Name, Address, and Telephone Number of the Official/s to whom comments concerning this document should be forwarded.

**RESPONSE:**

This information was provided in the cover letter which accompanied the document.

The following comments represent a summary of substantive comments on the EA received at the public hearing held on December 13, 1993, in Dodson, MT. Many other comments generally supportive or adverse to the mine in general were received and are available for public review. They are not duplicated here because they are not specific to the EA.

**COMMENT:**

1. When Zortman mining was first initiated in the late 1970's Phillips County was part of the gas boom taking place in the northern part of the County, as well as the construction of the American Colloid Bentonite Plant. Employment was doing well and the County was enjoying the benefits a healthy economic environment provides. At this stage Zortman was constructing its leach pads and beginning the process of leaching gold.

Just as Phillips County started to appreciate the profits of the oil and gas boom, the market dropped out of the oil and gas industries and the prices crashed. Without the drilling activity the Bentonite plant closed its door and demolished the plant. Zortman Mining helped stabilize the economy by providing employment at the mine and employment by the mine contractor and other businesses that provide services to the mine. This operation has had a significant positive impact on the tax base of Phillips County, and helps every person who lives in the region by providing a significant impact to the ad valorem property tax based system.

In 1993 Zortman mining and its major contractor provided \$1,009,850.00 in property taxes. This figure does not include the Resource Indemnity Trust Tax or the Metalliferous Mines tax that is paid to the State of Montana and provides additional tax revenue.

In 1989, the State of Montana removed from local control the tax on its net proceeds and royalties. The impact of this legislation moved Zortman Mining to the largest industry in Phillips County dealing with the local ad valorem property tax. Taxable value for Zortman Mining and its contractor for 1993 is \$4,070,121. Total taxable value for the County is \$19,865,693. This means that for 1993, Zortman Mining will comprise slightly over 20 percent of the ad valorem tax base for the County. These taxes support the local governments, roads, schools, state equalization, and all the services a county provides to its citizens.

I have three illustrations of the contributions of Zortman Mining, Inc. The first is a bar graph demonstrating the actual tax dollars paid by Zortman Mine to Phillips County since 1983. This does not include taxes paid by those working for Zortman Mine or supporting businesses excluding the mine contractor. The second illustration is a pie chart illustrating the percent of taxable value that Zortman now comprises in Phillips County. As stated previously, that figure is now 20.04 percent of the County total. In other words, the current road and county levy is 47.76 mills. Without the mine and mine contractor, and the levy would have to be 60.07 mills to generate the same level of taxes, which means that each taxpayer would have had to pay 13 mills higher than what they did in 1993. The third illustration is an abstract of the makeup of taxable values for Phillips County compiled by my deputy, Terry Lodmell. This abstract demonstrates the changing environment since 1979 and compares the values of agricultural, residential, commercial, state allocations, and mining.

In 1979 agriculture made up 47.18 percent of our taxable value. Today its 33.98 percent. Residential property made up 11 percent in 1979; today it's 8.41 percent. Commercial property in 1979 was 6.08 percent. Today it's 4.06 percent. State allocations were 31.38 percent, and today are 32.45 percent. Mining was 3.53 percent, and today is 20.49 percent. As you can see, the ever changing trend indicates the growing role of mining in Phillips County and its positive impact.

Illustration 1 is a steady scale up the ladder. Illustration 2 is the pie charts. This section here is what Zortman mine contributes to Phillips County. The third illustration is a huge graph that shows how the growing trend of mining has increased in Phillips County and its positive impact. (Barnard, Phillips County, 1993.)

**RESPONSE:**

Thank you for the detailed economic information.

**COMMENT:**

2. One area I would like to comment on that is an issue in the EA is the pump back station. Zortman mining has done a very good job out there as far as these pumpback stations.

**RESPONSE:**

Comment noted.

**COMMENT:**

3. Many of the slopes that are rather steep have good vegetation growing on them. There was some erosion but a lot of this vegetation is only a year or two old and I hate to see these torn up and recontoured and then have them start all over again on their reclamation.

**RESPONSE:**

Monitoring will be used to determine the need for disturbing or reclaiming previously re-claimed sites. If it is necessary to assure long-term ARD control it will be done.

**COMMENT:**

4. We feel that the Alternative 'D'--the suspension of mining in Zortman is not in the best benefit of Phillips County.

**RESPONSE:**

Comment noted. The agencies would select the Alternative which provides the greatest assurance that long-term water quality standards would be met.

**COMMENT:**

5. Zortman contributes a lot of funds to our local schools, not only through the metal mines trust fund, but in their generous donations all across Phillips County and the State of Montana.

**RESPONSE:**

Thank you for the information.

**COMMENT:**

6. I grew up in Malta in Phillips County. A lot of my friends I went to high school with work at Zortman mine and they're a very valued part of Phillips County. We also treasure the Little Rocky Mountains and I believe what's found in this environmental assessment more

than above protects the environment in the Little Rockies and for us and our families in years to come.

**RESPONSE:**

Comment noted.

**COMMENT:**

7. My fear more than anything else is that we would not be given the chance to stop any adverse affects of mining up there, and that the mine cleanup would be placed in the hands of the government, some kind of a superfund thing.

**RESPONSE:**

The corrective action process is designed to provide a permittee a process for developing cleanup procedures to be submitted for agency review and decision-making

**COMMENT:**

8. If the mine is shut down, and the tax base there, where are the dollars going to come from to do this work? Our monitoring program has increased over the years. We've added more sites. We're approaching 200 wells and surface sites for monitoring.

**RESPONSE:**

Reclamation of the site, in the event of a shutdown would either be funded by ZMI directly or with the bond ZMI has on file with the agencies.

**COMMENT:**

9. ARD is a problem, but it's a problem that technology can solve, and we're about to do that. The EA is backing that up with a lot of information. Part of that is with the reclamation program.

**RESPONSE:**

Comment noted.

**COMMENT:**

10. Another area is air quality, some people really don't think about. We have 9 sites with 10 monitoring facilities around the mountains and in the mountains. We have them located in Lodgepole, Hays, Beavercreek, outside the Landusky area, right in Landusky, one right in Zortman by the schools, and right by the '91 pad, and monitoring all the dust in the metals that we might be losing, and we're checking that. Every three days we change those filters.

**RESPONSE:**

Thank you for the air quality monitoring information.



**COMMENT:**

11. In the EA they've changed it from a few inches up to 7 inches for the hundred-years, and that's good because we're looking ahead.

**RESPONSE:**

Comment noted.

**COMMENT:**

12. This year alone, ZMI has spent over two point six million dollars for heavy equipment and that's strictly dedicated to reclamation.

**RESPONSE:**

Thank you for the information.

**COMMENT:**

13. This process with this acid rock drainage started, oh, about 18 months ago in the summer of 1992. Initially we put in pumpbacks and caught the acid rock drainage that came off to the southern side of the range. There was none of this drainage on the north side of the range, contrary to some people's belief.

**RESPONSE:**

ZMI reacted fairly rapidly to obvious changes in water quality. The actions taken in the summer of 1992 were "stop-gap" measures and require improvement. Although water in drainages to the north has not become acidic, measures need to be taken to assure that it does not.

**COMMENT:**

14. You look at the Mill Gulch Waste Depository--the top of this clay cap this summer before all those rains, and right now there's no flow coming out of the toe of the waste rock dump. Sure, it's winter time, but we also had 11 inches of rain during July.

**RESPONSE:**

Thank you for the information. This supports research data that indicates capping reduces infiltration.

**COMMENT:**

- 15a We are committed to fixing our own problems, but we're not only committed to those. We've removed about 120 thousand tons of historic tailings out of King Creek and we did that this summer. That project right now is complete, except for the bumper dam which will be removed in February. All those tailings have been removed, we've topsoiled it and revegetated it.

**RESPONSE:**

Thank you for the information.

**COMMENT:**

- 15b We've removed about 350 thousand tons of Ruby Gulch tailings.

**RESPONSE:**

Thank you for the information. This action should result in an improvement in water quality in Ruby Gulch.

**COMMENT:**

- 15c Montana Gulch, the historic acid rock drainage there, we've worked on improving that water quality and we've done that.

**RESPONSE:**

We are aware of ZMI's on-going efforts to remediate historic impacts to Montana Gulch.

**COMMENT:**

16. The water quality range is going to be better when we leave than before we got there.

**RESPONSE:**

Water quality will only improve as a result of improved reclamation strategies, and if necessary, water treatment. With the exception of the Gold Bug adit discharge into Montana Gulch, pre-mining water quality was very good.

**COMMENT:**

17. I tried so hard to work with the children around Lodgepole and the Hays area. I went to Zortman mines to deal with Pegasus and I got shot down. Right now there's a genocide. It's going on among my people. There's no jobs. Your taxes are really doing good, but the death rate is really going good on my rez, too. There's no jobs. There's nothing coming in.

**RESPONSE:**

Thank you for the information. Corrective actions to control ARD would not affect employment or distribution of taxes.

**COMMENT:**

18. Now, I've got a little nephew who can stand there and his nose just starts bleeding. The only thing that rests on my mind is that, you know there's a problem with alcoholism on my reservation and it's killing them. But we can do something for the children, like this newborn right there.

**RESPONSE:**

Thank you for the information. Through the corrective actions proposed in the EA, contingency plans and comprehensive plans to be evaluated in the EIS, ARD would likely be controlled. Efforts to control ARD would have no effect on social issues.

**COMMENT:**

19. We need the wildlife around there. That's what we survive off of. We can't go to Buttreys, IGA and buy the things that you can buy. We can all come together and be friends and work with one another.

**RESPONSE:**

Wildlife information is presented in detail in the 1979 EIS and is summarized in various EA's. Corrective actions proposed in the EA would minimize any long-term effect on wildlife.

**COMMENT:**

20. How it is that we're mining sulfite ores, when as far as I know, this operation doesn't have a permit to be doing so.

**RESPONSE:**

Approval was issued in Amendment 10 to mine an additional 60 to 65 million tons of ore. That amendment included the statement that pockets of sulfide ores encountered during oxide ore mining would be processed along with the oxide ores.

**COMMENT:**

21. I'd like to see some of the comments from the EPA and the Dept. of Health and Environmental Sciences included in this document. We have other agencies that have expressed a lot of concerns about what's happening here, and really, their concerns aren't hardly even mentioned in this document.

**RESPONSE:**

The EPA and the DHES cooperated in the preparation of this EA and their comments were included. Additional specific agency comments and responses are included in this comment-response package.

**COMMENT:**

22. My only point is, the accountability, and do we know more of good thing is really necessary. I do feel that the reclamation recapping that we've started is sufficient. I do not feel that the current reclamation that's been completed needs to be rescinded or redone.

**RESPONSE:**

Monitoring plans outlined in the EA will collect data that the agencies would use to objectively determine the sufficiency of reclamation efforts.

**COMMENT:**

23. In the document they state one hole was in a pattern that has a marginal negative value. Well, in the gate, that whole block of blue waste--I basically feel that a mass volume calculation needs to be considered for the total net neutralization of that block, rather than in one hole out of, say, 600 jeopardizing that waste material that could be doing some good for the operation.

**RESPONSE:**

A mass volume calculation to analyze total NNP of that block is not useful. No matter how much neutralizing material could be mined with run-of-mine material, this neutral material is not truly available for reaction. In place of blending lime in the dumps, nonreactive waste will be characterized by sampling every blasthole for total sulfur. If any sample in the pattern exceeds 0.2 percent total sulfur, the whole block will be classified as reactive.

**COMMENT:**

24. We need moderate some of the procedures to make them reasonable, and go forward, assess what the results are, and possibly, from that, with some further mitigation.

**RESPONSE:**

Procedures are constantly being reevaluated based on incoming data. As that data is evaluated, procedures are modified to assure the accuracy of data interpretation, as well as reasonableness.

**COMMENT:**

25. The government should work with the mine instead of against them. I was really upset last spring when we got that 7 or 8 inches of rain in one night, and instead of going in there and taking BLM equipment or State equipment, helping them dam up those streams so they wouldn't flow the acid drainage down the streams, instead they fined them instead of helping them.

**RESPONSE:**

The DSL and BLM administer regulatory programs, not aid programs. Neither a legal basis nor legislative/congressional funding exist for the sort of program proposed.

**COMMENT:**

26. I also think Pegasus really needs to foster communication with the public and with concerned citizens whether they're ranchers, farmers, miners, conservationists, fisherman, hunters--whatever it is they've done a poor job of fostering openness about the problems at the mine.

**RESPONSE:**

Comment noted.

**COMMENT:**

27. The sulphide water which comes from that tunnel [the Gold Bug] is great to irrigate alfalfa and grass for livestock. In fact, it gives it some nutrients for a little food value for the livestock. It was the first time when that water was hit they were able to irrigate across the main highway going from Hays to the divide.

**RESPONSE:**

Thank you for the information.

**COMMENT:**

28. Just a couple of weeks ago when I was up there, it's unbelievable on the reclamation on that mountain, the foliage, the grass, the shrubs that are coming where they've reclaimed, and I think it's going to be a real boom someday to the wildlife and possibly cattle grazing, but you can just see parts up there you can just imagine, lots of deer, and everything up there.

**RESPONSE:**

Thank you for the information.

**COMMENT:**

29. They're well prepared, but like 7 to 11 inches of rain, you know. Edwin, he's been in Montana in Phillips County a long time; he hasn't seen that. So, I think they're equipped to handle the normal and more than the normal, but no matter what job we have or what business we're in, we always reach a point where something--an emergency hits us, and we have to regroup a little bit.

**RESPONSE:**

Thank you for the information. Reasonable contingencies must be developed wherever practicable.

**COMMENT:**

30. All the core drilling and exploration drilling we do out there on a 20-foot interval. We send that ore to the lab and they run an NNP, which stands for Net Neutralizing Potential. I have a data base in NNP values and total sulphur values are part of that implementation, so that we can predict and understand how much potential sulfides we do have, and we can design for that.

**RESPONSE:**

Thank you for the information. This information is gathered to plan and monitor activities designed to remediate water quality problems.

**COMMENT:**

31. I think that to continue with modifications to the permit as per the EA is definitely the right way to go.

**RESPONSE:**

Comment noted. A comprehensive ARD/water management and treatment plan will be evaluated in an EIS to assure the development of adequate long-term plans which supplement the corrective actions proposed and evaluated in this EA.

**COMMENT:**

32. Whatever effect Zortman mining or Little Rocky Mountains has on the bigger picture, it's almost negligible. If you read the hydrology report, whatever has happened to the drainag-

es and the mountains, if you go down stream one mile, it hasn't changed for the last thousand years--the water quality--and I think that's important.

**RESPONSE:**

Elevated sulfate concentrations persist further downstream. With regard to metals and acidity, the modifications to the mining and reclamation plans are necessary to assure continued protection of downstream water resources as well as to remediate impaired water quality near the mine.

**COMMENT:**

33. Please explain some of what you're planning to do in this forum?

**RESPONSE:**

As noted at the beginning of the public hearing and at various times throughout, the purpose of the hearing is to solicit oral comment on the EA, as required by the MEPA regulations.



**COMMENT:**

1. The document is vague. It does not explain articulately what will be done. It does not explain how it will be done.

**RESPONSE:**

Chapter II summarizes what is proposed and how it will be done. Additional detail is provided in referenced documents which are all available for public review.

**COMMENT:**

2. Effectiveness is not measured in any quantitative measure.

**RESPONSE:**

Effectiveness will be monitored as a part of the Reclamation Surface Performance Study (ZMI, 1993a and ZMI letter dated January 24, 1994) and through instrumentation using best available technology and monitoring of all facilities. Water quality monitoring as well as other monitoring procedures are described in Chapter II.

**COMMENT:**

3. If adjustments to these conceptual plans are made, will the public have the opportunity to review the adjustments?

**RESPONSE:**

The conceptual plan provides for a "maximum capping sequence" which consists of regrading to slopes where a 12-inch clay liner may be compacted, the installation of synthetic liners on surfaces less than 5 percent grade, a 3-foot nonacid-generating capillary break, and 18 inches of soil. This capping sequence has been documented to be effective. An EIS will be prepared to evaluate a comprehensive Landusky plan. The EIS will include a comment period.

**COMMENT:**

4. Will an additional environmental document be prepared for review?

**RESPONSE:**

Short-term measures are being addressed by the supplemental EA. Long-term requirements will be analyzed in an EIS.

**COMMENT:**

5. Why didn't the Department wait until a final plan was developed to ask for comment, rather than asking for comment on conceptual plans?

**RESPONSE:**

See response to comment 6 above and the decision record.

**COMMENT:**

6. Page 22 states "If it is not feasible to bury and cap all acid-generating portions of the pit walls, then reclamation must provide for neutralization of acidic runoff from the highwalls and diversion of runoff around acid-generating areas." However, the EA fails to instruct the reader HOW this will be accomplished.

**RESPONSE:**

The sentences which follow the statement you quoted do describe passive measures for treatment of this water. If needed, active treatment will also be available. A treatment plant for the Zortman mine is currently under review by the Water Quality Bureau.

**COMMENT:**

7. How much ore was permitted for Montana Gulch?

**RESPONSE:**

11.9 million tons. Originally, a 20 million-ton leach pad was permitted. In 1985 and 1986, 5.3 m.t. were placed on this pad. The final design for the leach pad extension accommodates an additional 11.9 m.t.

**COMMENT:**

8. Can Sullivan Park and Mill Gulch withstand the addition of the ore originally slated for Montana Gulch without serious environmental repercussions?

**RESPONSE:**

If this modification is required by the agencies, its use is contingent upon receipt of a detailed engineering design and evaluation by a registered professional engineer, which documents that potential leach pad stability concerns with this location have been satisfied. Otherwise, the previously permitted expansion of the Montana Gulch leach pad would be allowed to proceed. Final designs for the Montana Gulch leach pad extension, which would have a capacity of 11.9 million tons, have already been approved and were reviewed with acid rock drainage concerns in mind.

**COMMENT:**

9. The EA discusses the construction of additional ponds that would be required but it fails to state where and how they will be constructed.

**RESPONSE:**

Additional ponds for collection of acidic drainage would be required below both the Mill Gulch waste rock dump and the Sullivan Park leach pad dike. They would be constructed by extending existing roads to the proposed pond sites, then excavating into bedrock.

**COMMENT:**

10. The Department is to be commended for stating outright that the modified acid-base accounting (ABA) method as modified by Schafer and Associates, is simply an analytical

method that is not always valid. Does the Department intend to use a more reliable method knowing this one is not always credible?

**RESPONSE:**

Yes. Long-term field scale leachate extraction testing using coarse run-of-mine material and column testing will be required to validate the correlation to total sulfur. These tests will be designed to evaluate materials of various total sulfur content to demonstrate whether the 0.2-percent total sulfur cutoff is appropriate. Column tests have already begun, and will show whether waste containing less than 0.2 percent-total sulfur can be used for reclamation capping. With regard to the use of acid-base accounting to evaluate reclamation materials, the cutoff of 3 or greater NP:AP ratio and an NNP of + 20 or greater has been documented to be appropriate for use (SRK, 1992).

**COMMENT:**

11. AWL takes exception to the recommendation that water quality tests, analysis and monitoring be conducted by ZMI. Due to the long history of non-compliance at these mines, that amounts to letting the fox guard the hen house.

**RESPONSE:**

ZMI turned itself in by providing the agencies with the data which resulted in all of the ongoing enforcement actions, litigation, and reclamation plan revisions. The agencies do collect samples to verify the accuracy of data submitted by ZMI. Falsifying data is against the law and would ruin the credibility of ZMI's consultants as environmental scientists. (See also response to Freyholtz, comment 4.)

**COMMENT:**

12. Page 26 of the EA states "Diversions intended to prevent erosion of, or infiltration into, facilities containing acid-generating material after final reclamation must be designed to withstand a 7-inch, 24-hour storm event." How will this be accomplished?

**RESPONSE:**

This will be accomplished by building the diversions wide and deep enough to retain peak runoff from such a storm. Models determine appropriate riprap sizing for diversions, based on peak volumes and velocities of water. Where appropriate, channels can be cut into bedrock or constructed with concrete.

**COMMENT:**

13. Will increasing general water resources monitoring from twice a year to three times a year be adequate? Perhaps monthly testing would better reflect the progress of mitigation efforts.

**RESPONSE:**

Monthly sampling (or more frequent where appropriate) does occur under the operational monitoring plan. Operational monitoring is designed to track the progress of mitigation efforts, as well as to rapidly detect any new changes in water quality. General monitoring is not conducted by ZMI employees.

**COMMENT:**

14. The discussion on suspension of mining was totally inadequate and dismissed without substantive consideration. Stating it "would not improve water quality" and could potentially result in additional damage to the environment" are unfounded claims without substantiation. The EA further states "The neutral materials recovered from continued mining are the source of capping materials for reclamation." This infers that mining in perpetuity will be necessary in order to reclaim the site. It is irresponsible to suggest that total reclamation cannot occur and that environmental damage will continue to occur if mining is stopped. This alternative needs a substantive, thoughtful analysis which the EA did not include.

**RESPONSE:**

The EA does not imply mining in perpetuity, and that should not be inferred. A finite amount of nonreactive rock is required for reclamation capping to control acid rock drainage. ZMI has only been segregating such waste rock for 1 year, since the ARD situation was identified. Amendment 10 permitted continued mining through 1995. The additional 2 years of waste segregation would greatly increase the available stockpile of reclamation material.

**COMMENT:**

15. The analysis for wildlife is very poor. Stating on page 70 ". . . Landusky would be returned to production through reclamation, thus, limiting effects on wildlife." doesn't cut it. Again, no quantitative nor qualitative data was given to make this assumption.

**RESPONSE:**

The EA should have stated that if the Zortman mine expansion were permitted, any usage of the Goslin Flats area south of Zortman by wildlife would be precluded for several years. This would be partially offset by reclamation elsewhere.

**COMMENT:**

16. It is very difficult to comment on the proposed EA when it is inconclusive as to what the Department actually intends to do and how it intends to do it. Considering the serious nature of the problems at Z/L, it is disappointing the Department did not clarify its position better. AWL cannot comment on the agency's plan of action until it is further defined and put out for public review. The current EA is insufficient to determine if the proposed mitigation will be effective.

**RESPONSE:**

The current EA clearly described ZMI's proposed plans for the Mill Gulch and Gold Bug dumps, as well as the Sullivan dike. Nothing else has been proposed, therefore nothing else can be better clarified at this time. The conceptual plan was provided for review and analyses as a contingency plan where the company would be held to a "maximum capping sequence", which consists of regrading to slopes where a 12-inch clay liner may be compacted, the installation of synthetic liners on surfaces less than 5 percent grade, a 3-foot non acid-generating capillary break, and 18 inches of soil. This capping sequence has been documented to be effective. Further an EIS will ultimately be prepared to evaluate a comprehensive capping and water treatment and management plan. The agencies included a discussion of conceptual plans for other facilities, to aid in the public's understanding of

**COMMENT:**

17. The location chosen for this hearing was biased as the majority of attendants were employees of the mine.

**RESPONSE:**

Comment noted. The agencies are concerned about accessibility to hearings. Based upon past polarization of audiences in Malta and Lodgepole-Hays, the agencies determined Dodson was a likely neutral community. The decision was also based on the addresses of meeting participants at scoping meeting held on related projects. In the event that Dodson should be inaccessible to the Lodgepole-Hays residents who participated in past meeting, arrangements were made to accept oral comments at the local BLM area office in Malta. To date, no one has taken advantage of this option.

**COMMENT:**

18. An additional hearing should be held on the Fort Belknap Reservation for the people who must live with the mine on a daily basis.

**RESPONSE:**

See the response to comment 17 above.

**COMMENT:**

1. We renew our request for more time, until January 31, 1994, and more hearings, in Hays and Lodgepole.

**RESPONSE:**

The time period established is consistent with that required by the Montana Environmental Policy Act (MEPA). See also response to Freyholtz comments 1, 2, and 6.

**COMMENT:**

2. Please see earlier materials submitted to the agencies are made a part of the record.

**RESPONSE:**

They are.

**COMMENT:**

3. We direct your attention to the comments of Summit Envirosolutions attached hereto as regards their comments."

**RESPONSE:**

Thank you. Please see responses to specific Summit Envirosolutions comments.

**COMMENT:**

4. The SEA is stated to supplement EA 10 which was an amendment to the state and federal operating plans which allowed construction and operation of the Sullivan 1991 pad and other modifications. The SEA should supplement all previous EA's since all facilities (pads, dumps, pits, etc) are conceded to have substantial AMD potential which must be addressed. Therefore, the SEA is irretrievably flawed and inadequate because the scope is inadequate. The SEA needs to be withdrawn and redone.

**RESPONSE:**

EA 10 provides the reference to the EIS and EA's previously completed for this project. References to these documents is also provided in Chapter 1, page 1 of the Corrective Action EA. Thus, the SEA contains, in its scope, reclamation for all Landusky mine facilities.

**COMMENT:**

5. One would never know upon reading the SEA that massive violations of the federal Clean Water Act and the state Water Quality Act are ongoing.

**RESPONSE:**

Enforcement actions taken by the DHES and EPA are outside the scope of this EA.

**COMMENT:**

6. Federal law requires the Secretary to prevent such ongoing degradation.



**RESPONSE:**

That is the purpose of the Agency Modified Alternative -- to prevent unnecessary or undue degradation.

**COMMENT:**

7. Since there are massive violations of the CWA and State Water Quality Act ongoing, it would be illegal to allow an amended plan of operations ignoring these unquestioned violations.

**RESPONSE:**

Criteria for making decisions on corrective actions are provided in the applicable statutes: MMRA, FLPMA, CWA and MWQA. The modification is designed to address these problems though it cannot rule on their compliance.

**COMMENT:**

8. The SEA should be withdrawn and amended to add full discussions about the illegality of issuing an amended plan when there are ongoing water quality violations.

**RESPONSE:**

There is no illegality involved in issuing an amended plan when there are ongoing violations from another agency, especially when the amendment is to help address these problems.

**COMMENT:**

9. An EIS for each dump, pad and pit may be necessary.

**RESPONSE:**

The National Environmental Policy Act (NEPA), and the Montana Environmental Policy Act (MEPA) and supportive case law prohibit the segmentation of analysis that you have proposed.

**COMMENT:**

10. The gross inadequacies of the SEA are discussed in some detail in the comments of Summit Envirosolutions attached hereto as Exhibit B.

**RESPONSE:**

Please see responses to specific Summit Envirosolution comments.

**COMMENT:**

11. It seems critical to fully evaluate all potential groundwater incursions into the pads, dumps and pits using a full EIS since capping will do nothing to solve this very serious problem. If there are groundwater impacts, entire dumps or pads may need to be rebuilt. This matter needs to be fully discussed using a full EIS.

**RESPONSE:**

This will be addressed by the up-coming EIS. However, groundwater does not enter pits because the pits are above the static water table. Groundwater incursions into pads and dumps are expected to correspond with discharge rates from springs which were present before the construction of these facilities. In contrast with surficial discharge, these volumes of water are insignificant. Because any groundwater which may enter such facilities will require treatment as per the 1979 EIS, impacts to downgradient water quality would not occur.

**COMMENT:**

12. A full EIS is needed under federal regulations because the impacts are significant, there is a great public interest, and many other reasons which relate to the regulations issued under NEPA.

**RESPONSE:**

Please see the decision record. An EIS will be prepared.

**COMMENT:**

13. Bonding needs more discussion as it appears quite clear current bonds are woefully inadequate.

**RESPONSE:**

A discussion of bonding is outside the scope of the EA. Bonding is an enforcement tool to implement the reclamation and closure plan. Current bonds for Zortman and Landusky total \$25,000,000, which would cover the costs of surface reclamation and long-term water treatment. Bonding files are open to public review and you are welcome to submit suggestions for specific revisions.

**COMMENT:**

14. Cultural considerations are nonexistent and need full consideration in a full EIS.

**RESPONSE:**

Cultural considerations will be given full consideration in the forthcoming Zortman EIS. However, cultural considerations are unaffected by corrective action measures because no increase in permit area is proposed. The Landusky cultural resource issues were fully adjudicated by the Interior Board of Land Appeals (IBLA) under the Amendment 10 appeals.

**COMMENT:**

15. The cumulative impacts discussion is not adequate. The SEA states at page 67, no further mineral development is proposed. However, an expansion is proposed at the Zortman portion of the mines which will involve a large pit and fully sulfide mining.

**RESPONSE:**

The text on page 67 refers to Landusky. The agencies are not aware of any plans for mine expansion at Landusky. If you have information to the contrary, please provide it. A discussion regarding future mining at Zortman is present on page 68. With regard to "fully

COMMENT:

16. Agency comments indicate the EIS for the Zortman expansion should consider a pit at Landusky. Clearly, there should be full consideration of a pit at Landusky which will severely impact the current operations. Clearly cumulative impacts are not adequately discussed.

RESPONSE:

The issue of a potential pit at Landusky will be reevaluated if such a proposal is made.

COMMENT:

17. DSL promised a full EIS would be prepared in such a case. This promise was included in the letter of Dennis Casey, Commissioner, DSL of June 12, 1990, wherein it states in part:

Third, before any major amendments would be issued in the future, the Department would prepare an EIS, particularly if any significant amount of sulfide ore were to be mined, unless the data clearly shows that no EIS is necessary. Ex. C

RESPONSE:

The DSL did not promise an EIS for the evaluation of corrective actions necessary for previously approved mining as evidenced by the language in the above quote.

COMMENT:

18. The SEA states suspension of mining was not considered basically because an alleged loss of jobs. SEA, p. 28. There was no consideration of the fact rebuilding the mine to alleviate AMD problems would provide a multitude of jobs! This has been the case at other mines where AMD created problems. The SEA should be withdrawn and a full EIS prepared.

RESPONSE:

The loss of jobs is one of several possible effects of a suspension. The remainder of the text addresses legal procedures required to suspend operations. A comprehensive plan for addressing acid rock drainage will be evaluated in an EIS.

Exhibit A:

COMMENT:

1. Exhibit A: Reply of Red Thunder, Inc. to answer DSL, BLM, and ZMI is response to RTI's Motion for a Stay and to RTI's Statement of Reasons. IBLA 93-412 and 93-413.

RESPONSE:

This attachment is not directly related to the corrective action. Previous responses to Exhibit A have been submitted to and accepted by the Interior Board of Land Appeals (IBLA). Exhibit A, responses and decision records are available for public review at Agency offices.

Marble Exhibit B: Summit Envirosolutions letter dated December 23, 1993

COMMENT:

2. On the surface, the efforts to reduce future impacts from acid rock drainage (ARD) as presented in the EA are commendable. The task of addressing and abating existing acid-generating potential of the mine is gargantuan. The proposed abatement plan presents a feasible alternative but tended toward simple encapsulation of the acid-generating material. This type of abatement may be proved historically to not protect long-term impacts. The additional proposed abatement options presented by the state do appear to optimize the use of neutralizing material to potentially reduce the generation of ARD. The degree of technical and engineering modification presented by the state could be interpreted as concern for the protection of the local environment and short term abatement of the situation. The proposed proactive geologic sampling for segregation of the various types of acid and neutralizing materials also shows the state's concern for long-term abatement and protection of the local and regional environment. However, these methods of abatement of the ARD may not ultimately provide long-term protection of the local and regional environment.

RESPONSE:

The effectiveness of methods proposed for acid rock drainage control under the modified alternative were well documented by previous work. See Harries and Ritchie, 1987; and SRK, 1992 references in the bibliography. An EIS will be prepared which evaluates comprehensive reclamation, water management, and treatment plans.

COMMENT:

3. While the EA appears to satisfy NEPA requirements, the fact that impacts have occurred as a result of activities discussed in prior NEPA documents suggests that a greater degree of environmental analysis may be required (e.g.EIS).

RESPONSE:

As noted in the EA, the potential for development of acid rock drainage was previously evaluated, but was determined to be improbable based upon static acid-base tests. There is no guarantee that, had an EIS been prepared in 1990, the need for kinetic testing for acid-producing potential would have been identified. Both EA's and EIS's can and do provide thorough environmental analyses. An EIS will be prepared which evaluates comprehensive reclamation, water management, and treatment plans.

**COMMENT:**

4. It is our opinion that the amount of hydrogeologic characterization may not be adequate to responsibly monitor potential impacts. Very little data regarding aquifer characteristics (e.g. hydraulic conductivity, transmissivity, head distribution) was presented in the EA. The analysis of groundwater data indicating "no impact" is worthless without first characterizing the hydrogeologic flow regime. It is likely that, after review of well construction and lithologic details, contaminants would not be expected to be detected after only 3 years of monitoring. Unless the aquifer systems are better understood, the present monitoring system cannot be evaluated for the effectiveness to detect impacts. In addition, the groundwater/surface water interaction cannot be evaluated. We question the actual integrity of the pad liners and suspect that significant leakage may be occurring.

**RESPONSE:**

Most monitoring wells at the Landusky mine have been in place longer than 3 years. Some were present prior to initiation of mining by ZMI. Most wells are proximal to the facilities which they are intended to monitor. These wells should and do reflect impacts. Bedrock groundwater movement is dominantly fracture-controlled, and the potentiometric surface generally mimics topography. As measured beneath Zortman mine pits, hydraulic conductivity within igneous bedrock typically approximates 0.23 feet per day, with average transmissivities of 27 feet per day (Hydrometrics, 1992). Leach pads are built over french drain systems and effluent from these underdrains is monitored frequently. Any significant leakage would be immediately detected. Data and references are available.

**COMMENT:**

5. Groundwater samples collected at monitoring wells completed in fractured bedrock should not be field filtered. Total metals, not dissolved metals should be analyzed at these locations.

**RESPONSE:**

Filtering of groundwater samples is standard procedure, and is based upon water quality regulations. (See ARM 16.20.1003.)

**COMMENT:**

6. The intuitive ability of carbonate rock present in the stream beds to neutralize acids and precipitate metals should be scientifically addressed.

**RESPONSE:**

Reclamation and/or water treatment will require that water not be contaminated prior to reaching outcrops of carbonate rock in streams. Actual scientific field observation has lead to the conclusion that the carbonate beds are acting as neutralizing material.

**COMMENT:**

7. Could the discharge of leach pad water through the intentionally perforated pad liners constitute a discharge into groundwater? Would this be considered an injection well?



**RESPONSE:**

Perforation of leach pad liners that would result in a groundwater discharge would require appropriate permits prior to implementation. This is not considered an injection well.

**COMMENT:**

8. What is the ratio of neutralizing material to acid-generating material to mid-range material? Is enough neutralizing material generated to handle the acid-generating material? What is the neutralizing capacity of the "neutralizing material" and does it differ in degrees with different types of neutralizing material? What is the ratio of these differing types of neutralizing materials and is the amount of "high quality" neutralizing material sufficient to serve as a neutralizer for all the acid-generating material that is disturbed and distributed?

**RESPONSE:**

It is implied in this set of questions that the reactive material will be blended with neutralizing material to mitigate contaminated seepage or runoff. This is not what is proposed. Acid-generating material will be capped with a compacted clay cap to restrict infiltration and to reduce oxygen transport into the facility. Restriction of runoff and infiltration of precipitation will decrease the mechanism by which contaminants are transported, i.e. water transport. Reduction of oxygen transport results in a marked decrease in the rate of oxidation of pyrite and therefore the rate of acid production.

Rock, with a ratio of neutralizing potential (NP) to acid potential (AP) of 3 or greater and a net neutralizing potential (NNP) greater than +20, will be placed over the clay infiltration barriers to prevent erosion, root penetration, and desiccation of the clay cap. Required slope angles and stormwater diversions are intended to provide a method for runoff source control and preclude erosion of the soil and capping materials.

If and when the operator can demonstrate, by the use of long-term field scale leachate extraction tests using coarse run-of-mine material, that the low sulfur rock (< 0.2 % total sulfur) is not reactive, then its use as reclamation material will be allowed. If the operator cannot demonstrate that the low sulfur rock is not reactive, then limestone or other barren rock not associated with the mineral deposit may have to be quarried for reclamation purposes.

**COMMENT:**

9. The covering of the acid-generating material does not remove or solve the acid-producing potential of the material. The material will outlast any cover or liner and then represent an acid source threat to the environment - most likely long after the mine is shut down. The acid-producing material could either be neutralized before it is disposed of or layered or mixed with neutralizing material sufficient to act as a buffering agent for the expected life of the acid-producing potential of the material (i.e. commingle the material instead of the "radial layering" as presented).

**RESPONSE:**

The mitigation is to control the rate of material oxidation such that impacts from ARD are not significant. Control for contaminant migration is the 2000 + foot thick ring of calcareous marine sedimentary rock and the calcareous sediments and soils derived from said rock which comprise the Little Rocky Mountains and which encircle the mineral deposit and associated rock facilities. With regard to blending as an effective method to mitigate acid



rock drainage. In this case it has proven ineffective because water established preferred transport paths through the coarse rock. Any lime or limestone blending will soon be exhausted or washed away along these pathways. ZMI was formerly practicing blending lime into the waste dump, but that did not prevent acid rock drainage (ARD). Lime amendments are effective if the neutralizing material can be intimately mixed with the reactive material such as in the case of a tailing slurry. However, no tailing is generated from the processes used by ZMI.

**COMMENT:**

10. Do surface and groundwater from this area flow or hydrologically connect with King Creek and Carter Gulch to the north of the site? Are these streams monitored for groundwater discharge for the mine area? Are the monitoring reports available for review?

**RESPONSE:**

Carter Gulch is south of the Zortman mine. King Creek is adjacent to Landusky pit areas, and hydrologic connections are possible; however, monitoring data for King Creek wells and surface water sites do not show acid drainage. These data (wells ZL-139 and ZL-140; surface water sites L-5, L-6, and L-39) are available. One explanation for the lack of impacts to King Creek from the pits is that the pre-existing Gold Bug Adit that underlies the pits discharges into Montana Gulch. This adit was driven in 1960 - 1964 to drain groundwater from upper portions of the ore deposits.

**COMMENT:**

11. Is the method that ZMI would use to visually analyze sulfide percentages a Standard Method that is reproducible or does it allow subjective interpretation to determine the potential acid production?

**RESPONSE:**

There are standard methods for visually estimating the percentage of a given mineral in a rock. Subjective interpretations based upon knowledge of mineralogical associations and general lithology will help predict tendencies toward acid-producing potential. Grid sampling followed by total sulfur analyses of samples would also be required.

**COMMENT:**

12. Is the ZMI lab state certified or inspected to verify the analytical results the "self policing" aspect of the company produces? Are split samples collected and analyzed during routine sampling by ZMI and their consultant?

**RESPONSE:**

ZMI's job is not a state-certified laboratory. Therefore, water samples are required to be sent to independent, certified laboratories for analysis. In addition, the company conducts sampling on a more frequent basis to guard against cyanide leaks. The agencies also do verification sampling during inspections. Splits, duplicates, blanks, and other QA/QC sampling is required.

**COMMENT:**

13. What type of vegetative cover will be used that would not threaten the capillary breaks referred to in the report?

**RESPONSE:**

The agencies are concerned with capillary rise of acid solutions through the reclamation capping layers from below via the pore space between mineral particles of soil/waste rock, regardless of the presence of plant roots. Plant roots are concentrated in the soil layer. The amount of plant roots penetrating through the soil layer, into or through the capillary break layer would jeopardize the overall function of the capillary break.

**COMMENT:**

14. Has ZMI or DSL prepared a water balance for the mine area?. We question the prediction that groundwater recharge from all Landusky pits averages 28 gpm.

**RESPONSE:**

There is an accurate water balance for the processing circuit. The process circuit is designed to a maximum capacity of 452 gallons. The mine operates at approximately 60 percent capacity during normal operations. With regard to the water balance for the mine area, all Landusky pits are located at the top of a ridge so very little runoff or groundwater inflow is associated with these disturbances. The EA for Amendment 10 discusses pit infiltration for all Landusky pits on page 49 (BLM-DSL, 1990).

**COMMENT:**

15. We cannot agree or disagree with the "environmental consequences" without additional time and information including inspecting the final size of the mine waste, topographic relief, proximity of the northern streams and if they are perennial, the leaching process and the volumes of water allowed to drain into the groundwater from the leach pads, etc. We would also need to review the previous reports that address air. ACECs, cultural resources, farmlands, flood plains, Native American religious concerns, threatened and endangered species, hazardous and solid waste (acid mine water), riparian wetlands, wild and scenic rivers, and wilderness.

**RESPONSE:**

This information is available to the public and is located either within the current Environmental Assessment, previous EA's or the EIS, or within agency files.

**COMMENT:**

16. Does DSL's June 12, 1990 letter (Exhibit C) commit to an EIS for sulfide mining?

**RESPONSE:**

No it does not. DSL's commitment was that before any major amendments would be issued, the Department of State Lands would prepare an EIS, unless the data shows that an EIS is unnecessary. However, DSL did not promise to prepare an EIS for the evaluation of corrective actions necessary for previously approved mining.

COMMENT:

1. The agencies should make an effort to meet the needs of communities most impacted by agency decisions. It is a hardship for Fort Belknap residents, who have turned out in high numbers for mine related hearings on the reservation, to make a long drive off reservation for a hearing.

RESPONSE:

Comment noted. The agencies are concerned about accessibility to hearing. Based upon past polarization of audiences in Malta and Lodgepole-Hays, the agencies determined Dodson was a likely neutral community. The decision was also based on the addresses of meeting participants at scoping meeting held on related projects. In the event Dodson should be inaccessible to the Lodgepole-Hays residents who participated in past meeting, arrangements were made to accept oral comments at the local BLM area office in Malta. To date, no one has taken advantage of this option. Written comments receive the same consideration as oral comments. Anyone who chooses not to attend a hearing or call, may submit written comments instead.

COMMENT:

2. There is also a very real cultural intimidation factor relative to a hearing being held in Dodson so close to Malta and the center of Zortman-Landusky employment.

RESPONSE:

Comment noted. See response above. The purpose of the hearing was to solicit substantive oral comments on the analyses document. Approximately 50 percent of mine employment is outside Malta and approximately 30 percent is centered in the Hays-Zortman area.

COMMENT:

3. We support a hearing clearly catering to people with livelihoods dependent on mining, but only if it is balanced with a hearing sensitive to the concerns of people who must live with the environmental impacts of mining.

RESPONSE:

The hearing is not intended to cater to any audience. All potential attendees must make their own decisions to attend or not. See response to above comments.

COMMENT:

4. The Zortman-Landusky operation is, in the eyes of Fort Belknap people, destroying lands and waters of great cultural significance and, many believe, threatening community health.

RESPONSE:

Thank you for your opinion.

COMMENT:

5. At the Dodson hearing, you stated that questions regarding the EA would not be addressed because technical people were not on hand.

**RESPONSE:**

That is correct. The purpose of the hearing is to obtain comments on the EA.

**COMMENT:**

6. You stated that resources are not sufficient to hold an additional hearing, and wonder just how are agency resources are being expended?

**RESPONSE:**

Agency resources are expended as directed by the legislature.

**COMMENT:**

7. If our public agencies wanted to solicit company views on Zortman-Landusky and its "excellent environmental track record," the one-hour Dodson hearing provided that opportunity. The concerns of employees are important, but it would not be inaccurate to characterize the sole hearing provided to date as little more than a "Pegasus pep rally."

**RESPONSE:**

The purpose of the hearing was to solicit substantive oral comment on the EA. Unfortunately, many comments did not address the EA. That, however, does not change the purpose of the hearing.

**COMMENT:**

8. If agencies also care to hear from people who live in the shadow of the mine, or from people who are attempting to study mine issues and the reasons behind the Montana Department of Health and Environmental Sciences filing a major lawsuit against Zortman Mining, Inc. for alleged violations of the Montana Water Quality Act, then an additional hearing must be held.

**RESPONSE:**

Hearings are not informational meetings. If anyone is interested in the reasons behind or in an informational meeting on the MDHES lawsuit, they are encouraged to contact MDHES at 444-2406.

**COMMENT:**

9. For the Department of State Lands and Bureau of Land Management to suggest that they have met the needs of citizens they are supposed to represent regarding the future of the Landusky half of Montana's largest open pit cyanide heap leach gold mine with a single scoping meeting for an EA in Dodson is a farce.

**RESPONSE:**

Thank you for your comment. The purpose of the hearing was to solicit substantive oral comments on the analyses document. The meeting was not a scoping meeting. The agencies are concerned about accessibility to hearing. Based upon past polarization of audiences in Malta and Lodgepole-Hays, the agencies determined Dodson was a likely neutral community. The decision was also based on the addresses of meeting participants at scoping

meeting held on related projects. In the event Dodson should be inaccessible to the Lodgepole-Hays residents who participated in past meeting, arrangements were made to accept oral comments at the local BLM area office in Malta. To date, no one has taken advantage of this option.

The hearing is not intended to cater to any audience. All potential attendees must make their own decisions to attend or not.

**COMMENT:**

10. A 13-year legacy of inadequate agency oversight culminating with apparently illegal sulfide ore mining over the past several years and related severe water degradation deserves more from responsible authorities than the barest minimum.

**RESPONSE:**

The corrective action Environmental Assessment (EA) represents a comprehensive analysis of a specific, limited, proposed action. A long-term comprehensive plan will be evaluated in an Environmental Impact Statement (EIS). ZMI has not been illegally mining sulfides. The currently approved plans are on file and open to public review should you have questions about what is approved.

**COMMENT:**

11. There is no justification for providing only a minimal comment period for this EA, especially in light of the numerous mistakes and oversights by regulatory agencies which are now the legacy for which the current EA is required. Mineral Policy Center therefore remains on record requesting a hearing regarding this EA on the Reservation and an extended comment period to facilitate as much public review as possible.

**RESPONSE:**

The minimal comment period is zero days. The agencies provided the normal 30-day comment period for EA's established in the regulations.

**COMMENT:**

12. The "Consultation and Coordination" section on page 73 of the EA offers an overview of public involvement. The activities outlined at length in the second paragraph, however, had nothing to do with this EA. The four scoping meetings mentioned all were held specifically to address the proposed Zortman expansion. Their inclusion makes it appear that far more public participation has been facilitated for this EA than has been the case.

**RESPONSE:**

This was not the intent of the paragraph you reference. This information was provided to explain the source of the issues identified. Although, as you note, the scoping meetings were held to address the proposed Zortman expansion. Many people commented extensively on both mines and acid rock drainage (ARD) concerns.

**COMMENT:**



13. We also believe that a full Environmental Impact Statement is warranted for addressing operating and reclamation plan modifications.

**RESPONSE:**

We agree, and will be preparing an EIS to address these concerns. However, certain changes in operation must be made now to address the existing conditions.

**COMMENT:**

14. It is documented that the Department of State Lands assured the EPA in 1990 that an EIS would be developed for the Landusky Mine in the event that sulfide ores are exposed. In a letter of 12 June 1990 regarding future operations at the Landusky mine, for example, State Lands Commissioner Dennis Casey stated to State EPA Director John Wardell that "before any major amendments would be issued in the future, the Department would prepare an EIS, particularly if any significant amount of sulfide ore were to be mined, unless the data clearly shows that no EIS is necessary."

**RESPONSE:**

This issue of a major mine expansion/amendment at Landusky will be evaluated if such a proposal is made.

**COMMENT:**

- 14a Several years later sulfide ores are indeed being mined, apparently illegally, and only an EA has been developed to address the consequences. Especially in light of the current Department of Health and Environmental Sciences lawsuit regarding considerable water degradation resulting from such mining, there is certainly no data suggesting an EIS as unnecessary. Mineral Policy Center believes that, following years of minimal environmental review, a comprehensive EIS is required to address complicated and ongoing problems at both the Landusky and Zortman mine operations independent of other permit needs.

**RESPONSE:**

The June 12, 1990 letter, the 1990 Environmental Assessment (EA), and the 1989 permit application all clearly state that some sulfide materials would be disturbed by the permitted mining operation. Waste-rock-related acid drainage was disclosed in the 1990 EA. An Environmental Impact Statement (EIS) will be prepared regarding closure requirements and water quality standards. That document will be independent of the interim reclamation plan modifications discussed in this EA. Sulfide ores are not being illegally mined. If you are unclear as to what is permitted, please read previous EA's and EIS's or review copies of the permits on file at the agencies.

**COMMENT:**

15. Regarding the EA itself, it is fundamentally flawed in that it dismisses consideration of suspension of mining operations as an alternative. It suggests that such suspension "could potentially result in damage to the environment." It says nothing about what may happen if further acid-generating sulfide rock is exposed through continued mining.

**RESPONSE:**

Mining is essential as a source of non-acid-generating reclamation material unless increased disturbances associated with mining distal, barren, neutral material is warranted.



**COMMENT:**

16. Are we to conclude from the assessment that continued mining is required for any environmental mitigation, and that mining in perpetuity will be necessary at Zortman-Landusky? Clearly a suspension of mining would have some obvious benefits, including the fact that the acid mine drainage problems at the Landusky operation would not be further aggravated, expanded, and complicated.

**RESPONSE:**

A finite amount of caprock is necessary for capping existing facilities; therefore, the need for such material to be mined does not imply perpetual mining. Amendment 10 covered mining through 1995. This EA does not extend that timeframe because no additional ore reserves have been proposed or approved for mining.

**COMMENT:**

17. Clearly a suspension of mining would have some obvious benefits, including the fact that the acid mine drainage problems at the Landusky operation would not be further aggravated, expanded, and complicated. Suspension of mining must be meaningfully considered as an alternative.

**RESPONSE:**

It was meaningfully considered but dismissed as nonviable. A permit issued under MMRA may not be revoked unless a failure to comply with enforcement orders can be demonstrated. However, MMRA and BLM regulations provide for reviewing and revising plans to resolve in anticipated situations. In addition, mining is needed to provide materials for reclamation. Suspension of mining would result in continued rock weathering and exacerbate acid rock drainage, it would not result in any reduction of problems.

**COMMENT:**

18. The document also claims without substantiation that suspension of mining would result in the loss of over 200 jobs. It is entirely conceivable that the present mine work force could be employed in efforts to address current mine reclamation concerns prior to continued mining. This is the case at the Richmond Hill Mine in South Dakota (which has also experienced serious AMD problems), for example. At the Summitville Mine in Colorado the EPA is employing mine workers in its AMD mitigation and reclamation efforts. For this document to simply assume a loss of jobs with a suspension of mining is biased and unfounded.

**RESPONSE:**

Most reclamation which can be accomplished prior to final mine closure has already been done. Pit backfilling could not be done during a temporary mine shutdown; all minable reserves must first be removed. Most leach pads are still actively being leached, and others have not been rinsed; therefore, little leach pad reclamation activity is possible at this time. Reclamation of the old waste rock dumps is nearing completion, and the new Gold Bug dump is reclaimed concurrently with construction.

**COMMENT:**

19. The statement on page 29 that "Corrective actions being implemented concurrent with mining would have more beneficial environmental effects than immediate mine closure would" must be called to question. According to who, and based on what assumptions?

**RESPONSE:**

The BLM and DSL have determined that continued mining will retain the workers and equipment on site which are necessary for accomplishment of the reclamation activities, which will improve water quality and wildlife habitat. Non-acid-generating material must be mined in order for reclamation to be done. This material may be mined either from existing pits during continued mining or from new pits in previously undisturbed areas if mining ceases. As noted in the EPA comment letter, it is not particularly significant whether mining continues or not because sulfide rocks have already been exposed in the pits and placed in the dump and heap and must be reclaimed in a similar manner whether mining proceeds or not. Given these factors, the agencies have determined that halting gold mining and acquiring the necessary capping materials through limestone mining elsewhere in the Little Rocky Mountains would have unnecessary environmental impacts.

**COMMENT:**

20. Many Native Americans living adjacent to the Zortman Landusky Mine believe its continued operation is desecrating and destroying land and resources that were part of the Fort Belknap Reservation (prior to the Grinnell agreement) and that continue to hold an inherent and profound cultural significance. To suggest that continued mining has "more beneficial environmental effects" ignores Native American values that have been eloquently expressed to those who will listen (again, officials who are preparing documents like this need to make more of an effort to do some scoping in the Native American community).

**RESPONSE:**

Since 1989, the agencies have conducted over 10 public meetings at Hays and Lodgepole, and have listened to the concerns of those citizens. Additional briefings have been provided to the Fort Belknap Citizens Council (FBCC). Although the focus of some of those meetings was the proposed Zortman mine expansion, the Landusky mine was also discussed at those meetings, including concerns about its impacts on water quality and on the spiritual values associated with the mountains. The agencies have heard and do understand the concerns of the local people. To the extent allowed by law, they have been considered in the decision-making process.

**COMMENT:**

21. Page 31 of the EA states that "cultural resources" and "Native American religious concerns" would not be influenced by the proposed modifications to the approved mining and reclamation plans. Again, the EA dismisses any suspension of mining, and continued mining is, to many Native Americans, destroying cultural and sacred resources. For the EA to ignore this fundamental aspect of the Zortman-Landusky operation is a callous denial of basic public concerns.

**RESPONSE:**

The EA compares the end result of previously approved activities to the current proposal, which does not involve additional mining, only changes in the reclamation plan. This in no way denies the existence of the basic public concerns. However, these concerns were fully considered in the Amendment 10 decision, and that decision was fully adjudicated by the Interior Board of Land Appeals (IBLA).

**COMMENT:**

22. The EA does not mention the current bond on the Landusky operation and its adequacy relative to newly disclosed environmental problems and proposed mitigation measures. Bonding should be discussed.

**RESPONSE:**

Bonds have been raised to account for additional reclamation costs associated with acid rock drainage. However, bonding is not a corrective action. The purpose of the Environmental Assessment was to evaluate specific corrective actions.

**COMMENT:**

23. How did current problems at the Landusky operation develop? It would seem useful to discuss how it is that a mining operation that is not permitted or bonded for the mining of sulfide ores has been mining sulfide ores for several years.

**RESPONSE:**

Mining of sulfide ores was permitted. Acid drainage developed because ore and waste not defined as "sulfide" also turned out to have acid-generating capacity. In the years since approval of Amendment 10, more rigorous standards of geochemical analysis have been adopted by the agencies so that future predictions can be made with greater accuracy.

**COMMENT:**

24. How is public confidence in this supplemental EA to be expected if regulatory failures and oversights or possible company noncompliances leading up to it are simply ignored?

**RESPONSE:**

This failure to accurately predict water quality impacts has not been taken lightly by the agencies; therefore, the mitigation plan described in the EA has been developed. This was discussed in the EA; please refer to page 3 for those actions which could be documented as violations. Noncompliances have been issued by the individual agencies pursuant to their respective authorities.

**COMMENT:**

25. The document should include information by which both the agencies and the public can learn from past mistakes.

**RESPONSE:**

Please refer to pages 3 and 25 of the EA, which explain how past use of static rather than kinetic testing of rock led to the false conclusion that the rock would not be acid-generat-

ing. This is further explained in the referenced February 3, 1993 letter from MDSL entitled "Landusky Mine Situation Report."

**COMMENT:**

26. A review of the Landusky operation track record to date is needed, along with a review of the adequacy of regulatory oversight, enforcement and monitoring. If shortcomings are disclosed, means to improve regulatory capability and resolve need to be addressed.

**RESPONSE:**

A MEPA/NEPA document for a specific action is not the place to conduct a programmatic review of regulatory agency functions or funding. To date, the Landusky mine has a good track record. Few cyanide leaks have occurred. These have been rapidly reported and remediated. When acid rock drainage (ARD) developed, ZMI installed pumpback facilities to prevent discharge of this water off-site. The agencies then required corrective actions to develop long-term source-control solutions to the ARD problems.

**COMMENT:**

27. The EA notes that the Department of State Lands "has issued a Notice of Noncompliance for failure to handle sulfide materials properly. Penalties will be assessed as soon as the Department has completed the processing of the corrective action and this MEPA/NEPA analysis." No justification is given for this decision to analyze corrective actions prior to pursuing the imposition of penalties.

**RESPONSE:**

The two actions are not dependent on one another and have nothing to do with MEPA/NEPA analysis. However, statutory time frames exist which establish agency priorities. The immediate concern is protection of water quality. Definition, evaluation, and appropriate implementation of corrective actions will protect water quality. Assessment of penalties will not reduce the generation of (ARD), nor is it an approved form of water treatment.

**COMMENT:**

28. Only cursory mention was made of the Department of Health and Environmental Sciences (DHES) filing of a complaint and application for injunction against Zortman Mining, Inc., relative to alleged numerous violations of the Montana Water Quality Act. There is no indication in the document that other agencies are working together or coordinating their actions with DHES. The proposed mitigation actions could temporarily cover up problem areas, further complicate legal proceedings, and further aggravate serious ongoing environmental degradation. Has this been considered?

**RESPONSE:**

As indicated on page 74, the production of this EA was coordinated with both DHES and EPA. The agencies will continue to coordinate their efforts, and work together to assure a coherent plan for water quality protection is implemented. Meanwhile, water quality is improving as a result of remedial actions such as diversion, pumpback, and capping. Current reclamation activities are not contributing to water degradation.

**COMMENT:**

29. Concerns of both the DHES and the EPA regarding the Landusky situation should be included in the document.

**RESPONSE:**

DHES and EPA concerns were included in the EA. See page 74. The EA discusses the roles of the various regulatory agencies, and relevant actions taken by those agencies.

**COMMENT:**

30. An assessment of the Landusky operation's compliance or noncompliance relative to the Federal Clean Water Act, the Montana Metal Mine Reclamation Act, the Federal Land Policy and Management Act, and other applicable laws and regulations would be helpful.

**RESPONSE:**

Compliance with various statutes is outside the scope of the EA. The EA was prepared to evaluate specific corrective actions. A summary, however, of applicable laws was provided in the introductions.

**COMMENT:**

31. The document characterizes the Landusky operation as "closed circuit" in its use of cyanide solution. This seems inconsistent with numerous documented instances of cyanide loss and possible ongoing cyanide discharges into groundwater.

**RESPONSE:**

Ideally, it is a closed circuit. Accidental leaks and spills do occur, but these are a violation of the approved plan. When leaks and spills occur, the appropriate "noncompliances" are issued by the agencies with the appropriate authority. The purpose of approved contingency plans is to protect the environment in the event of such accidents.

**COMMENT:**

32. On page 5 a statement referencing "discharge of acidic water downgradient of certain facilities" calls short-term measures to capture such water "marginally effective and demonstrate the need for mine plan modification." This statement is vague and misleading. As it seems critical to this mitigation assessment, an explanation is warranted.

**RESPONSE:**

What is vague or misleading about this statement? Some of the existing collection and pumpback systems either do not intercept all acidic effluent they are intended to capture (e.g. groundwater seepage) or do not have the capacity to contain all contaminated runoff during storm events. Therefore, they were described as marginally effective, and the EA stated that these capture systems will have to be improved (i.e. through mine plan modification and resizing). Despite their shortcomings, the existing systems can prevent much of the contaminated water from leaving the site most of the time.

**COMMENT:**

33. Page 16 states that Zortman Mining, Inc. has reached "a preliminary determination that a relationship exists between the rock's sulfur content and its net neutralizing potential." As



much of the proposed Landusky AMD mitigation plan is based on such neutralization, the characterization of "a preliminary determination that a relationship exists" seems considerably less than certain. What credibility does this "preliminary determination" have? Have its assumptions been demonstrated elsewhere? Has it been proven that the plan will work?

**RESPONSE:**

The correlation is adequate. What remains questionable is at what percent sulfur should the rock be considered acid-generating? Long-term leachate extraction testing using coarse run-of-mine material will be conducted to verify or dispute that the correlation between the rocks' reactivity and total sulfur can be used to accurately distinguish acid-generating waste from non-acid-generating waste. This testing will identify whether the currently used cut-off levels (0.2% and 0.5%) are appropriate. Until or unless such testing verifies or refutes the validity of this classification system, more stringent standards for capping materials will apply (see Alt. B, page 23).

**COMMENT:**

34. Page 22 states that "if it is not feasible to bury and cap all acid-generating portions of the pit walls, then reclamation must provide for neutralization of acidic runoff from the highwalls and diversion of runoff around acid-generating areas." This is rather significant and largely unexplained. If burying and capping is not feasible, how will neutralization be accomplished?

**RESPONSE:**

Most of the deeper (higher sulfide) portions of the pits would be buried and capped. Upper portions of the highwalls are already inaccessible and complete backfilling to pre-mining contours is not feasible. The primary mitigation method for surface water associated with the pits is capture and diversion of runoff before it reaches reactive rock in the very steep highwall. Treatment of any acidic runoff from the highwall would be required. This volume of water is expected to be minor compared to the amount of water which would be diverted. Passive methods of neutralization may include the use of limestone/lime construction materials and the construction of wetlands. Concise plans will be developed and analyzed prior to final reclamation of pits.

**COMMENT:**

35. Page 54 of the EA states: "The agencies' modified reclamation plan would assure that runoff from any pit highwalls which remain exposed after backfilling is completed would not discharge from pit areas in an acidified condition." Again, such assurance is not backed with an adequate plan of action.

**RESPONSE:**

Page 22 of the EA describes the agency's modified pit reclamation plan. Additional details of the plan will be developed by ZMI, then analyzed and modified as necessary in the Zortman/Landusky EIS. If the proposed passive treatment measures do not prevent acid drainage from pit highwalls, active water treatment would be required to assure that the statements on page 54 are correct.

**COMMENT:**



36. On page 22 of the EA the "Agency Modified Alternative" stipulates that "ZMI would be required to not proceed with the approved expansion plans for the Montana Gulch leach pad. Instead, ZMI would be allowed to utilize areas in and adjacent to the current Sullivan Park and Mill Gulch leach pads for placement of ore that would have gone on the Montana Gulch leach pad expansion." As, according to the EA, the Sullivan Park pad is 68 percent and the Mill Gulch pad 95 percent loaded, a question arises as to whether or not these pads have the capacity to handle additional ore originally intended for the Montana Gulch pad without compromising their engineered integrity. Also, do the words "adjacent to" in the above statement suggest that the current pads may be expanded? This should be clarified.

**RESPONSE:**

If this recommendation is adopted as a stipulation, the remaining permitted ore would be placed in a region between and north of the 1987 and 1991 leach pads (refer to figure 2 in the EA). The references to percent pad loading refer to volumes of ore permitted to be placed on those leach pads. The permitted volumes are not necessarily based upon maximum allowable tonnages which would remain stable if placed on each pad. Most of the additional mass would rest directly on bedrock and not add strain to the leach pad liner. In addition, since the Mill Gulch (1987) leach pad was constructed, it has been buttressed with the Mill Gulch waste rock dump which increases the stability of the overall structure. Also, this EA includes a proposal for buttressing the 1991 leach pad dike with an additional 300,000 tons of rock constructed with a 2.5:1 slope. The pad to be constructed between the two existing pads would be buttressed by approximately 5 million tons of waste and would tie into the Sullivan Park dike. It is important to note that this pad would be located in an area which is already largely disturbed and would confine the leach pad to a drainage where collection and pumpback is already occurring.

**COMMENT:**

37. The "Agency Modified Alternative" is highly dependent on company self-monitoring. This analysis should therefore include an assessment of the effectiveness of company self-monitoring to date, including timeliness, completeness, and accuracy. We believe it is readily apparent that far more monitoring must be performed by regulatory agencies as well. Also, increasing "general water resources monitoring" from twice yearly to three times yearly" as outlined seems woefully inadequate. In general the document fails to discuss monitoring needs and shortcomings, though in light of problems that have surfaced, it would seem apparent that monitoring has been seriously inadequate. Mitigation analyses should give far more attention to the nature and frequency of monitoring and its effectiveness.

**RESPONSE:**

Operational water monitoring currently is done on a frequent (from daily to monthly) basis, which is necessary for the rapid identification of any losses of cyanide solution. This monitoring also includes analyses for pH and conductivity, and will include sulfate (where appropriate), which are all indicators of acid drainage and other degradation. Extended analyses which include the entire suite of parameters listed in Table 5 of the EA are currently conducted twice per year. This EA has recommended adding a third sampling event, which will provide adequate data on area water quality. Due to the number of sites involved, the three sampling events will constitute near-continuous sampling throughout the spring-summer-fall months. Weather conditions preclude the need for a mid-winter sampling event. Most sites are inaccessible and/or frozen at that time. The combination of proposed operational and extended monitoring will adequately characterize site conditions. If the existing monitoring program, including "self-monitoring", were seriously inadequate, then acid rock drainage would have remained unidentified.

**COMMENT:**

38. A discussion of the benefits of a state and/or federal testing program for area wells, water supplies, streams, etc., which would include the involvement of the Fort Belknap Water Quality Program and local concerned citizens, is needed. As you know, many Fort Belknap residents believe their waters have been influenced by Zortman-Landusky activities. Such concerns should not be ignored.

**RESPONSE:**

The agencies do conduct additional monitoring to verify the results of sampling by ZMI and by other consultants. This, in conjunction with QA/QC sampling, verifies that sampling conducted by ZMI is effective and accurate.

**COMMENT:**

39. The EA makes several references to acreages on the Landusky site that have been re-claimed". What is the definition of such reclamation? Does such reclamation meet permit requirements? Page 70 notes that, if the Zortman expansion is approved, impacts on wildlife would be limited as "814 acres at Landusky would be returned to production through reclamation." This suggests that permit requirements call for reclamation to a level similar to existing natural conditions in the Little Rockies? Please elaborate.

**RESPONSE:**

To date, reclamation by ZMI has met specified requirements. The implication in the EA that all of the Landusky mine would be completely reclaimed prior to start-up of the Zortman mine expansion was unintended. Portions of pit highwalls are not required to be reclaimed, and some leach pads will remain active for years after mining at Landusky ceases. The statement is appropriate as a reflection of the long-term goals.

According to Montana's Metal Mine Reclamation Act, lands must be reclaimed to comparable stability and utility as adjacent lands. This is the intent of reclamation requirements for all mine facilities.

**COMMENT:**

40. Mineral Policy Center objects to the suggestion on page 70 that increased mining and subsequent loss of timber "increases edge effect and increases forage available, enhancing big game and upland game birds." Mining does not enhance wildlife and the suggestion that it does is an absurd rationalization at best.

**RESPONSE:**

It was not the intent of the EA to indicate that increased mining would improve habitat. The text is misinterpreted. The EA states that grassy slopes provide more forage than forested areas do. It is worthy of note that wildlife populations have in fact been observed to increase at some mine sites. In part, this is related to hunting restrictions on mine property.

**COMMENT:**

41. On page 31, the "status" of the '79 leach pad is characterized as "reclaimed". On page 51 it is stated that "Only 4.43 acres on the '79 leach pad have been reclaimed." Please ex-

plain this. The document has numerous qualifiers to proposed stipulations such as "where practicable" or "where feasible". It also calls for a wide range of capping requirements. Standards must be specific. Standards for capping and synthetic liners are not explained, and no quantitative documentation as to the adequacy of capping or synthetic liners is provided. The assessment is based on an unsubstantiated premise that only rainwater is infiltrating earth mining structures. Benefits of a water treatment facility are not discussed.

**RESPONSE:**

The 1979 leach pad has a total size of 4.43 acres. No other leach pad at Landusky has yet been reclaimed. Qualifiers such as "where feasible" are necessary because specific standards cannot always be universally applied due to topographical and engineering constraints. For example, if the Mill Gulch (1987) leach pad's slopes were all to be reduced to 3:1 slopes, disturbances would increase by 225 percent. Projecting these disturbances to all leach pads resloped to a 3:1 configuration, then the leach pad disturbances upon reslope might rise from 284 acres to 639 acres. Such disturbances are unwarranted.

The range of capping requirements also pertains to site-specific conditions such as slope angles and the nature of material beneath the capping layers. A reclamation surface performance study is being implemented to provide more site-specific guidance. (ZMI, 1993a.) Various field scale capping scenarios will be scientifically evaluated for maximum effectiveness to reduce infiltration and oxygen transport prior to placement.

If groundwater flows into facilities which contain acid-producing material, passive source control measures may not be able to prevent water degradation and active treatment may be necessary. Again, because of current ongoing litigation analyses of specific plans for water treatment are being deferred. The plans which are finally agreed upon or imposed will be analyzed in an EIS.

**COMMENT:**

42. In sum, the document is vague, biased, and appears rushed (there are many misspellings and grammar problems). Page 22 of the EA even admits that "The agencies have developed conceptual plans for the leach pads, waste dumps, dikes and pits, for this EA." Why are they only conceptual? After 13 years of problems, mishaps, and inadequate analyses at Zortman-Landusky, it's time to "get it right." The severe AMD problem the mine is currently experiencing is based at least in part on a failure to adequately contemplate the consequences of mining activities. It's also a legacy of years of permit amendments to EA's as opposed to comprehensive Environmental Impact Statements that could have foreseen today's problems. Solutions based on sound scientific analyses are needed at Landusky, not vague rushed conceptual plans.

**RESPONSE:**

ZMI has not yet proposed specific reclamation plan changes for a majority of their facilities including all pits and leach pads. In order to analyze effects over the entire mine site, the agencies did develop a conceptual plan for facilities where such changes were needed. Prior to approval of actual changes to reclamation plans for such facilities, ZMI must provide the agencies with specific plans, using the agencies' conceptual plan as a guideline. These plans must be based on best available technologies and approved prior to implementation. The agencies do not have the resources to develop specific, engineered mine designs for active mines, nor would it be appropriate for them to do so.

It is not a valid assumption that an EIS analysis would have foreseen the current ARD situation. The 1990 EA was quite thorough and an EIS would likely have been of similar scope.

**COMMENT:**

43. While agency attention to the serious problems at the Landusky site is welcome, an Environmental Impact Statement would better address their accumulated complexities and challenges. This EA may offer some immediate stop gap measures for dealing with AMD, and indeed such efforts should not be long delayed. But a comprehensive and objective review of a meaningful range of responses to the problems at Landusky is essential if a reversal in the course of developments with Montana's largest open pit cyanide heap leach gold mine is to become a reality.

**RESPONSE:**

The scope of this document is only intended to address and analyze interim measures while long-term reclamation requirements are being defined and validated through the EIS process.

**COMMENT:**

1. We are unable to determine whether there are any objective, or quantitative standards to which the mining operator will be held in ensuring that the acid drainage problem has been satisfactorily resolved.

**RESPONSE:**

The Montana Metal Mine Reclamation Act provides that mining disturbances will be reclaimed to comparable stability and utility. There are specific quantitative water quality standards which must be met according to the Montana Water Quality Act.

**COMMENT:**

2. The capping, handling and monitoring measures identified and made part of the plan should be useful and may even work. However, that is not clear; and there are no assurances that issues such as containment of acid drainage caused by underground water migration will in fact be successfully addressed.

**RESPONSE:**

The EA provides for the resizing of diversion ditches to reduce runoff, and installation of cutoff walls and resizing of all solution capture systems to restrict contaminant migration into the groundwater system. Water treatment is available as a contingency measure.

**COMMENT:**

3. Another issue is the lack of a bond to guarantee results. Thus, if the measures called for in the modified plan do not do the job, then it may well be necessary and appropriate to, e.g., install a water treatment facility. That is a palliative which was recently required, as a last resort, in the infamous Summitville mine fiasco here in Colorado. It's costly. The public should not have to bear that cost. While the mining company should not have to put, up front, the cash to cover such a contingency, and increase bond that will provide that funding, if necessary, seems appropriate and, we think, legally mandated.

**RESPONSE:**

Current bonding includes costs for water treatment.

**COMMENT:**

4. Because of the pendency of a "major federal [BLM] action which will significantly impact the environment," an Environmental Impact Statement is probably required. It is true that if the measures called for in the revised plan will unequivocally mitigate the problem, an EIS becomes unnecessary. Here, however, there is at least controversy about whether the mitigation measures called for will, in fact, fully ameliorate the acidic pollution. Thus, the kind of thorough review and public dialogue that the National Environmental Policy Act requires in instances such as this seems required. Indeed, it was our understanding that the Department of State Lands was committed to preparation of an EIS prior to any mining of sulfide ore.

**RESPONSE:**

Comment noted. Contaminant loading and associated impacts related to all facilities at the Landusky Mine will be evaluated in the EIS currently underway for the Zortman Mine expansion, a major amendment. Your understanding is inaccurate regarding the interpretation of



DSL's letter. The DSL committed to the preparation of an EIS "before any major amendments would be issued in the future....particularly if any significant amount of sulfide ore were to be mined...." This commitment does not refer to corrective actions regarding previously approved mining. An EIS is underway which will evaluate a major amendment, which proposes the future mining of significant amounts of sulfide ore. In addition, comprehensive ARD control plans would be evaluated.

**COMMENT:**

5. It was our understanding that the Department of State Lands was committed to preparation of an EIS prior to any mining of sulfide ore.

**RESPONSE:**

See response to Question 4.

**COMMENT:**

6. One would hope that the mining plan modification under review here will be consistent with whatever remedial measures are being sought by the Montana Department of Health and Environmental Sciences in that litigation.

**RESPONSE:**

The interim water management/source control measures proposed in this EA were reviewed by the DHES and the EPA. Thus, DSL and BLM hope that these measures are consistent with measures being sought by DHES and EPA through other processes. All available information compiled and disclosed during litigation proceedings will be used in future analyses in continued consultation with DHES and EPA. Further environmental review will be required once litigation has been resolved and proposed methods of meeting effluent limitations are approved.



Zortman Mining, Inc.

**COMMENT:**

1. Page 1, Paragraph 1: The document states that modified proposals have been submitted for all Landusky leach pads. Although ZMI has been pleased to discuss the modifications necessary to all leach pads to ensure attainment of future water quality objectives, it has not submitted modified plans to date.

**RESPONSE:**

The document refers to ZMI's commitment to delay perforation of leach pad liners given in ZMI's letter dated March 15, 1993; and to grid sampling prior to reclamation in ZMI's letter dated July 30, 1993. ZMI still needs to submit more detailed plans and designs for storm-water diversion structures, resizing of pumpback/solution capture systems, and leach pad and pit final reclamation.

**COMMENT:**

2. Page 5, Paragraph 1: The document infers that the solution capture systems are only marginally effective. This ignores the substantial positive changes in water quality which have occurred below all of our operations where these facilities have been placed. We welcome the opportunity to upgrade these facilities. However, I would point out that to date when we have attempted to permit the additional access or constructions necessary to improve these systems we have not been given approval for these projects.

**RESPONSE:**

Comment noted. Not all existing capture systems capture all acid water, particularly during intense storm events. We believe there is vehicular access to all pumpback facilities at the Landusky mine.

**COMMENT:**

3. Page 6, Paragraph 5: The discussion of the DSL Notice of Noncompliance makes no note of the fact that ZMI appealed the subject notice, nor of our reasons for doing so. We would hope the document will be corrected to note that ZMI disputes the allegations contained in the Notice of Noncompliance.

**RESPONSE:**

Comment noted.

**COMMENT:**

4. Page 6, Paragraph 7: Although ZMI did chose not to dispute the ability of the BLM state office to delegate authority to the District Manager to take corrective action, and while Zortman has moved quickly to address concerns raised by acid rock drainage, ZMI disputes the historical record presented in the EA. Most importantly, ZMI objects to any suggestion that sulfide materials were not handled in accordance with the provisions of the plan of operations. The plan of operations provided that waste rock would go to the waste rock repository without regard to acid-generating potential. Indeed, the EA for Amendment 10 explicitly recognized that potentially acid-generating materials would be placed in the Mill Gulch waste repository, and that document evaluated the environmental impact of those materials on that facility and water quality in that drainage.

**RESPONSE:**

4. Comment noted. Disputes regarding either BLM or DSL notices of noncompliance should follow the appeals procedures in those documents.

**COMMENT:**

5. Page 12, Paragraph 3: The ZMI plan is mischaracterized here. The ZMI plan calls for a completion to 4900-foot elevation with a decision on subsequent facilities construction to be reached following this objective. Past discussions with your staff have lead us to believe that there was agreement between all parties that 18 million tons of material could be stored in the Gold Bug Waste Repository (35 millions tons permitted under Amendment 10, minus the 17 million tons contained within the Mill Gulch Waste Repository). We expect that we shall continue with backfilling of the Gold Bug Pit to this 18 million ton limit, if we choose not to pursue other permitting options once we have reached the 4900-foot elevation.

**RESPONSE:**

Thank you for correcting this error. The Gold Bug Waste Repository is allowed to accept the 18 million tons of waste which would have been placed on the Mill Gulch Waste Dump.

**COMMENT:**

6. Page 22-03: *All Landusky Pits: Map pits by visual inspection for sulfides, paste pH, and total sulfur.*

ZMI will ensure that this objective is met during final reclamation.

**RESPONSE:**

The decision record will reflect what is authorized. Efforts to begin measures to increase the performance of the solution capture systems is expected to be approved.

**Attachment: Inferred Stipulations**

The agencies' value ZMI's interpretation synopsis of inferred stipulations and commitments made therein. The decision record will identify which stipulations will apply to the permit.

**COMMENT:** *Final bench surfaces tested for acid-generating materials.*

7. ZMI will use blast hole characterization data to identify acid-generating materials on benches to be abandoned during retreat reclamation.

**RESPONSE:**

Commitment noted.

**COMMENT:**

8. *Potential acid-producing areas capped with 6 inches of clay.*  
ZMI will implement this as part of its retreat reclamation procedures for mine pits.

**RESPONSE:**

Commitment noted.

**COMMENT:**

9. *Partial backfilling to bury exposed sulfides.*  
ZMI will comply with the MMRA requirements for pit backfilling.

**RESPONSE:**

Commitment noted.

**COMMENT:**

10. *Partial backfilling to create free-draining surface to Montana Gulch.*  
ZMI will ensure that this objective is met during final reclamation.

**RESPONSE:**

Commitment noted.

**COMMENT:**

11. *Backfill from Gold Bug waste repository, 1987 Leach Pad, or pit material.*  
ZMI will use the indicated materials during required backfill operations.

**RESPONSE:**

Commitment noted.

**COMMENT:**

12. Page 22-04: *Testing of exposed walls (total sulfur; static and leachate tests; in situ testing).*  
ZMI will ensure that this requirement is met in final reclamation.

**RESPONSE:**

Testing and capping of exposed walls needs to occur as the pits are being mined when access is more feasible.

**COMMENT:**

13. *Bury and cap acid-generating areas.*  
ZMI will comply with the MMRA requirement for pit backfilling.

**RESPONSE:**

Commitment noted.

**COMMENT:**

14. *Diversion of waters from exposed acid-producing areas.*  
ZMI will ensure that appropriate diversions are included in final reclamation.

**RESPONSE:**

Resizing/relocation/reshaping of watershed diversions will proceed immediately under the direction of the agencies as stipulated in the decision record.

**COMMENT:**

15. *Provision for neutralization of acidic runoff.*  
ZMI will ensure that this requirement is met in final reclamation.

**RESPONSE:**

Neutralization of acidic runoff will be provided for immediately as stipulated in the decision record.

**COMMENT:**

16. *Diversion of waters from pits areas.*  
ZMI will ensure that this requirement is met in final reclamation.

**RESPONSE:**

See response to Comment 14 above.

**COMMENT:**

17. *High NNP diversions downstream of pits.*  
ZMI will ensure that remedial measures are in place for all acid-generating and potentially acid-generating portions of the pits. Because the effectiveness of the high NNP diversions seems likely to be of only short duration (due to armoring of these materials), ZMI would prefer to use a mixture of diversions and wetlands to meet this objective.

**RESPONSE:**

The agencies agree this is only a short term measure. The effectiveness of this approach may be extended by mixing lime, crushed limestone and coarse riprap sized limestone and placing this mixture in the clay lined diversions where appropriate.

**COMMENT:**

18. *Constructed wetlands downstream of pits.*  
ZMI will ensure that this requirement is met in final reclamation.

**RESPONSE:**

Commitment noted.

**COMMENT:**

19. Page 23-01: *Leach Pads/Waste Repositories: (Inferred) ZMI will submit operationally complete structures for agency certification of acid-generating potential prior to reclamation.* With regard to future reclamation, it is unclear what the certification for non-acid-generating structures will entail. Because the certification process appears to be critical to reclamation planning, ZMI would hope to work with agency personnel to develop these guidelines.

**RESPONSE:**

The agencies will work with ZMI to establish and validate such criteria. It is anticipated that prior to any facility being certified as "non-acid-generating", ZMI would install instruments such as temperature probes, neutron probes and/or pore gas samplers to define temperatures, moisture content and oxygen content/transport within each facility. If continued monitoring indicates oxidation of pyrite is occurring, the facility would be regarded as acid-generating. ZMI would also be required to sample surface materials prior to capping.

**COMMENT:**

20. *3:1 slope on all uncertified structures.*  
Because three facilities were submitted for review in the ZMI proposal, and these reslope plans are not specifically changed in the agency preferred alternative, ZMI presumes that plans for these structures have been deemed suitable.

For all leach pads and waste repositories, it is unclear why the benefits of the shallower slope outweigh the penalties imposed by it. As ZMI noted in previous correspondence, the 3:1 reslope requirement will substantially increase the disturbance associated with reclamation. Some of this disturbance would involve the filling of the drainages immediately adjacent to the facilities. Finally, this requirement is not compatible with facilities engineering, which has been designed with slope reduction in mind. Consequently the 3:1 requirement will likely require slope construction, and building up of facilities with either mine waste or off-loaded pad materials.

**RESPONSE:**

ZMI's assumption is not entirely correct. Please note on page 23 of the EA that 3:1 slopes would be required only "where topographic considerations allow" and where determined feasible by the agencies. It is anticipated that any facility which requires clay capping will be reduced to at least 2.5:1 to allow for compaction of such a cap to a permeability of at least  $10^{-6}$  cm/sec. Permeabilities will be field validated through testing.

**COMMENT:**

21. *100-foot grid sampling of resloped surfaces.*  
ZMI will conduct the proposed testing as requested.

**RESPONSE:**

Commitment noted.

**COMMENT:**

22. *Areas > 0.5% sulfur would be capped as follows:*

*Slopes > 5%*  
*36 inches of yellow waste*  
*two clay lifts [12 inches total]*  
*capillary break - 36 inches of non-acid-generating material*  
*12 - 18 inches of topsoil*  
*Slopes < 5%*  
*36 inches of yellow waste*  
*two clay lifts [12 inches total]*  
*15 mil PVC*  
*liner shield [geotextile/tailings]*  
*capillary break - 36 inches of non-acid-generating material*  
*12 - 18 inches of topsoil*

ZMI understands that these capping requirements would extend to the portions of the three facilities in the submitted plan which return sulfur values of > 0.5 percent. For areas with total sulfur values of less than 0.5 percent, the capping sequences recommended by ZMI could be used.

With regard to the above capping sequences, ZMI believes that the requirement for two clays lifts is excessive, and that it will not materially impact the water balance within the reclaimed facility.

**RESPONSE:**

ZMI misunderstands the requirements. Final capping scenarios will not be approved until after completion of the EIS process. By instrumenting each facility with temperature probes and BAT gas samplers it may be determined whether an oxidation reaction is occurring. If after two years of accumulation of data, a facility is determined to be acid-producing the entire facility will be required to be capped with the capping sequence described in the EA.

The clay layer is critical to reducing oxygen diffusion and thermal convection. Oxygen transport either by diffusion or convection has been documented to be the rate controlling factor with respect to the oxidation of pyrite (Harries and Ritchie, 1987). Compacting clay in two separate lifts provides much greater assurance that portions of the liner will not be compromised by poor compaction or large fragments of shale which would protrude from the clay surface. Good compaction is crucial to minimizing infiltration and transport of oxygen. The reclamation surface performance study should evaluate the use of a 6" clay liner placed in one lift, a 12" clay liner placed in one lift, and a 12" clay liner placed in two lifts.

**COMMENT:**

23. *Reclamation to rock scree covers would not be allowed. ZMI will not conduct reclamation with the screen covers outlined in the submitted plan.*

**RESPONSE:**

Commitment noted.

**COMMENT:**

24. *Page 23-02: Specifications for non-acid-generating material used for capillary break: NP > 3AP, Segregation by lithology as well as total sulfur, "blue waste" used only after long-term leachate extraction test verify suitability.*



ZMI believes that this definition of non-acid-generating material (particularly the lithologic restrictions) will seriously impair the reclamation program. With these severe restrictions, there will be insufficient waste within the mining pits to provide for concurrent reclamation, and the bulk of the reclamation work would have to be postponed until the end of mining which is inconsistent with the primary objective of isolating potentially acid-generating materials by accelerated reclamation. At that point, either stockpiled material would have to be re-handled, or additional material would need to be quarried in a separate operation to provide for reclamation covers. Because of the added time and expense in performing reclamation in this manner, ZMI believes that a more reasonable definition of what constitutes acid-generating material is warranted.

**RESPONSE:**

Unless or until ZMI can show with statistical significance that the 0.2 percent total sulfur cutoff is appropriate, the criteria for non-acid-generating material will be in effect. Until data from long-term field scale leachate extraction testing using coarse run-of-mine material and column testing indicate that waste containing <0.2 percent total sulfur will not produce acid or release contaminants then ZMI will be held to the criteria given in the EA. Since the majority of the facilities will not be reclaimed until much later, the agencies believe there is time to conduct these tests. Meanwhile, ZMI will stockpile all blue waste encountered during mining should results indicate that this material is suitable for reclamation purposes.

**COMMENT:**

25. Page 23-03: *Sample water in leach pads for quality*  
ZMI will ensure that results of water samples for reclaimed leach pads are included within the annual report prepared by its third-party consultant.

**RESPONSE:**

Commitment noted. Please make sure all reports are submitted to the agencies in a timely fashion.

**COMMENT:**

26. *Track water levels in leach pad*  
ZMI will ensure that the above data is collected on reclaimed facilities.

**RESPONSE:**

Please include this data in the annual reports referred to in Comment 25. This is required for decommissioned pads as well.

**COMMENT:**

27. *Liner drainage plan:*  
*if degradation and accumulation do not occur - liner perforation after 10 years*  
*if degradation and/or accumulation occur - long-term water recovery*  
ZMI will complete reclamation according to the above specifications.

**RESPONSE:**

Commitment noted.

**COMMENT:**

28. Page 25-01: *Montana Gulch Leach pad extension: Landusky 85/86 Pad extension approval revoked - Landusky 87/91 Pad extension NEPA evaluation completed.*

ZMI will submit a geotechnical study to confirm the suitability of the site for this facility, thirty days prior to commencing construction.

**RESPONSE:**

The decision record will indicate whether the Landusky 87/91 Pad extension is authorized, and under what conditions it may proceed.

**COMMENT:**

29. Page 25-02: *Sullivan Park contingency pond: Landusky 91 Pad contingency to 1.3 million gallons or major storm event capacity.*

ZMI notes that the contingency pond is not a storm water structure, and that given the nature of its functions (recovery of process chemicals lost through the pad liner) no guidelines exist for sizing the contingency pond in relation to storm water runoff.

**RESPONSE:**

Comment noted. ZMI proposed that the pond be sized to 1.3 million gallons in their 1989 application. If ZMI considers the volume requirement to be exaggerated then the company should provide calculations which validate the appropriate pond size. Additional pond(s) will be required for collection of acid rock drainage. Calculations for the sizing of these ponds should also be submitted to the agencies.

**COMMENT:**

30. Page 25-03: *Mine Products Characterization: Static testing is inadequate.*  
Based upon other comments in this document, ZMI presumes that it may continue to use static testing to meet the objectives which specifically call for its use.

**RESPONSE:**

Material which can be statistically shown to have an NP:AP of 3 or greater and an NNP of + 20 or greater can be used to meet the reclamation objectives. For materials which don't meet these criteria, static testing (i.e. total sulfur content) is inadequate unless the results can be correlated to and are verified by long-term, field scale leachate extraction testing using coarse run-of-mine material.

**COMMENT:**

31. Page 25-04: *Field-scale leachate extraction for blue waste.*  
ZMI will begin the requested test during 1994.

**RESPONSE:**

Commitment noted.

**COMMENT:**

32. *Sample every blast hole for blue waste.*

ZMI compared the three derivative subsets from a master population of three hundred and ninety-one samples which was developed by sampling and testing of every blast hole in a drill pattern. An analysis of variance for the three populations demonstrates at the 95 percent confidence level that each is indistinguishable from its sibling populations, and ipso facto, from the parent population. These data are presented on a separate diskette, and an example of one of the analyses is attached. Given the lack of statistical data which suggests that an increased sampling frequency would better describe the entire population, ZMI does not believe that sampling of every blast hole is necessary.

**RESPONSE:**

Thank you for providing the additional data. The agencies will consider revising the testing requirement based upon review of this new data. It should be noted that the requirement to sample every blasthole is to be in affect when the mine geologist suspects that blue waste will be encountered. If ZMI currently does not have a mine geologist in the pit communicating with the equipment operators during mining successful segregation will not occur.

**COMMENT:**

33. Page 25-05: *Mine Facilities Monitoring: Excavate and test reclaimed areas on 100-foot centers.*

ZMI will conduct the required tests before submitting facilities for bond release.

**RESPONSE:**

ZMI will conduct the required tests as soon as possible.

**COMMENT:**

34. *Strip and recap based on total sulfur data/water quality.*

ZMI will strip and cap portions of previously reclaimed facilities which are underlain by acid-generating materials. ZMI presumes that the water quality management objectives will be those which were outlined in the original EIS for the project.

**RESPONSE:**

ZMI will demonstrate the acid-generating character of each facility. If the facility is suspected to be acid-producing then the capping sequence described in the EA will be used.

**COMMENT:**

35. Page 26-01: *2 years BAT monitoring prior to new reclamation.*

ZMI presumes that this requirement would be applicable only to those facilities which are awaiting certification as non-acid-generating, and that should ZMI choose to cap a facility according to approved plans that this monitoring would not be required.

**RESPONSE:**

The agencies apologize for the confusion and lack of clerical review of this document. ZMI's presumption is incorrect. The purpose for instrumenting all facilities is to certify

whether the facility is acid-generating or not. Data accumulated in the two year span will confirm or refute its acid-generating character. Also, if the facility is acid-generating, the two years of data will provide "baseline" conditions. After the approved reclamation capping sequence is in place subsequent sampling and testing will demonstrate whether or not the capping sequence is effectively controlling the oxidation of pyrite and the infiltration of precipitation.

**COMMENT:**

36. *Baseline conditions would be used for future monitoring.*  
It is unclear what the intent and objectives of this program are? ZMI asks that these items be specified, so that it can better understand their impacts upon the certification process.

**RESPONSE:**

See response to Comment 35 above.

**COMMENT:**

37. Page 26-02: *Watershed diversion structures: Final reclamation design minimum: 6-inch/24-hour event.*  
ZMI will design drains to a 6-inch/24-hour event.

**RESPONSE:**

ZMI will design diversions and drains to a 7-inch/24 hour event for permanent diversions. Temporary diversions will be designed to a 6-inch/24-hour event. See response to Comment 38.

**COMMENT:**

38. Page 26-03: *Final reclamation design maximum: 7-inch/24-hour event.*  
It is unclear why a 7-inch twenty-four hour event was selected. As noted elsewhere in the document, the NOAA atlas indicates a 3.9-inch 100-year event, and DSL calculations indicate a 6-inch event. ZMI believes that there are no data which would justify selection of the 7-inch event.

**RESPONSE:**

Based on all available data, the 100-year storm event appears to be 6 inches. DSL's previous calculations did not include a 1986 storm reported to have been a 5-inch event. Inclusion of this data would raise the calculated 100 year storm to nearly 7 inches. The agencies have required ZMI to design for storms in excess of the estimated 100 year event as a safety precaution.

**COMMENT:**

39. Page 26-04: *Geotextile over synthetic liner for drains.*  
ZMI will construct drains in this manner, except where, because of expected peak velocities, it is judged more practical to place the drain on bedrock or concrete structures.

**RESPONSE:**

Comment noted. The agencies agree that it is not necessary to line drains constructed in bedrock or concrete.

**COMMENT:**

40. Page 26-05: *Water Monitoring and Pumpback Systems: Additional wells: Landusky yard, Montana Gulch, King Creek (two), 91-LH-3.*

ZMI has already begun reporting data for 91-LH-3, and will continue to do so. In King Creek ZMI will replace wells ZL-139 and ZL-140 with wells located closer to mining operations in King Creek, during the completion of the tailings removal project. ZMI will install another monitoring well adjacent to the Landusky Plant, and another bedrock well in Montana Gulch below the contingency pond.

**RESPONSE:**

Commitment noted.

**COMMENT:**

41. Page 26-06: *Additional third-party monitoring: May, July, and October events. Raw data submitted within six weeks. Quality assurance/trend analysis in annual reports.*

The subject document notes that the current monitoring plan was adequate for ARD identification. Given that ZMI produces weekly or monthly data on most of these sites, it believes that a third monitoring event is not justified. ZMI will ensure that the data from the monitoring events are forwarded to the state within two weeks of the receipt of that data at the minesite. The current sampling program already contains some quality assurance checks, and the annual report has a discussion of the data contained within it. ZMI would request that the quality assurance and trend analysis expectations be more clearly defined.

**RESPONSE:**

Objection noted. Please arrange a meeting with DSL/BLM hydrologists and WOB to discuss appropriate methods of trend analyses. DSL recommends time series plots for selected parameters at selected sites, with more thorough trend analyses (e.g. Seasonal Kendall analysis) where appropriate. Parameters of concern would vary from site to site, but should generally include pH, sulfate, SC, and selected metals (e.g. As, Fe, Pb, Zn).

**COMMENT:**

42. Page 28-01: *Operational monitoring changes: L-3 - weekly - for extended data. L-5 - weekly; L-19, L-20, and L-21 - monthly, access by foot trail only. Trend analyses four times per year.*

ZMI will monitor L-3 and L-5 on a weekly basis as requested. It is unclear why the parameter suite has been expanded for L-3 versus other sites in the range, and ZMI would request that this sampling requirement be the same as for other sites in its operational monitoring program.

ZMI believes that the frequency and manner of access proposed for Bighorn Creek is unreasonable. It proposes instead to recondition the abandoned road which runs off of Damon Hill down to Bighorn Creek. It would sample Bighorn Creek at this location on a monthly basis during the period of May through October.

It is unclear what the requirements and expectations are for trend analyses of the operational data. ZMI requests that expectations for this program be more clearly stated.

**RESPONSE:**

Continued Eh measurements will characterize the reduction oxidation potential of the adit discharge with respect to time and demonstrate that the adit water is or is not being impacted by oxygenated infiltration from pits located above.

DSL is not aware of the referenced road. Please meet with the agencies to discuss whether or not this road would be appropriate, and which sites in Bighorn Creek should be monitored.

Trend analysis requirements will be clarified in an up-coming meeting. Requirements for operational monitoring will be different than for general monitoring. Time series plots of pH, sulfate, and SC for each site would be appropriate. At critical sites, these plots would be updated quarterly. For other locations, annual updates would be adequate.

**COMMENT:**

43. Page 28-02: *Capture systems to 10-year/24-hour event.*  
ZMI will comply with this request. However, ZMI notes that this will require new construction below the affected facilities. Barring further agency comment upon this subject, ZMI will consider approval for these disturbances to be implicit within this document.

**RESPONSE:**

This EA serves as the environmental document which has evaluated impacts from disturbances associated with resizing the solution capture system. Environmental documents are not approval documents. Final design should be submitted to the agency for immediate review and approval.



**COMMENT:**

1. We are directly downstream of the Zortman mine operation, so if anyone had a problem it should have been us. We haven't. If mining should close down, how would our water system remain in operation?

**RESPONSE:**

Currently the water system is a self-sustaining system maintained by user fees. If the number of users decreased, fees would have to go up or the association would have to seek other sources of funding.

**COMMENT:**

1. We are concerned that the proposed mitigation technologies are largely untested; hence, it is not possible to determine either the consequences or the significance of the effects that may result from the proposed action. It is premature to assume that this approach will solve the problem.

**RESPONSE:**

Similar reclamation strategies have been applied elsewhere. Various strategies have been studied for many years and proven very effective in decreasing contaminant loading. A good example is the Rum Jungle studies conducted by Harries and Ritchie of the Australian Nuclear Science and Technology Organization which were referenced in the EA. The agencies will be preparing an EIS to address some of the uncertainty regarding impacts.

**COMMENT:**

2. The EA makes a credible argument for additional mining to provide an adequate supply of low sulfide rock that then would be used as cap material for reclamation. We agree that this concept should be tested but caution that it is premature to assume that this approach will solve the problem.

**RESPONSE:**

The agencies have not assumed this approach will solve the problem. As noted in the EA, acidic seeps may remain. These may require treatment. (See response to comment No. 1.)

**COMMENT:**

3. We encourage permitting additional mining only in the low sulfide areas that are suitable for use as cap material and postponement of additional disturbance in high sulfide areas. Pilot scale testing would allow both the company and the regulatory agencies to evaluate the effectiveness of mitigation and, if necessary, modify the reclamation plan. If the technology is not successful, an additional problem would not have been created during the interim.

**RESPONSE:**

Mining has already exposed sulfide material in the pit walls and floors. The EA requires that non-acid-generating material be used for capping unless further testing prove the suitability of using low sulfur waste as a capping material. If testing does not substantiate the 0.2 percent total sulfur cutoff as appropriate, barren, unmineralized limestone and dolomite will be used as capping/riprap material.

**COMMENT:**

4. Will wetlands and diversion ditches lined with limestone require maintenance in perpetuity?

**RESPONSE:**

Yes. If a self-sustaining diversion design cannot be developed, then bonding will be structured to provide funding in the future for these maintenance practices.

**COMMENT:**

5. The EA (p.25) identified uncertainties about the neutralizing capacities of blue and yellow waste and that this has implications to segregation and management of the various waste

materials. These uncertainties should be resolved before initiating mining of additional sulfide bearing ores.

**RESPONSE:**

Final pit reclamation plans are dependent upon testing which will be conducted as the deposit is being mined and when pits reach their final configurations. The company will be required to develop specific closure plans which will be subject to agency review. The issue is not the ores, but the waste materials to be used for capping. (See response to comment No. 4.)

**COMMENT:**

6. A plan should be developed to deal with acid generation from the leach pad foundation.

**RESPONSE:**

Any residual acidic seepage not eliminated by dike capping (note: venting of steam from the dike has been observed during cold weather, which is indicative of acid formation occurring within the dike) would require additional treatment of some kind. Capture and treatment of ARD generated from below the leach pads will be provided for.

**COMMENT:**

7. The detection limits for cadmium in water (p. 46) are much higher than the water quality criteria for protection of aquatic life. There are techniques available for measuring the concentration of cadmium in water that can detect concentration lower than the existing water quality criteria for cadmium. These procedures should be required.

**RESPONSE:**

The detection limit for cadmium is 1 microgram per liter. The chronic aquatic standard for cadmium is 1.1 micrograms/liter at 100 mg/L hardness (actual hardness at site L-25 varied between 244 and 860 mg/L). The "<" symbol shown before the average cadmium concentration at site L-25 on page 46 was an error.

**COMMENT:**

8. While the impacts to date on fish and wildlife resources due to acid mine drainage are minimal, we are concerned that impacts could become significant in the future. We are further concerned about sending a signal to other mining companies that unanticipated acid mine drainage can be dealt with in a business-as-usual manner. We favor a conservative approach to additional mining until we have had time to evaluate the success of reclamation technology being employed.

**RESPONSE:**

The agencies are required to revise operating and reclamation plans when the need is realized. It is the intent of the agencies to proceed with these revisions in a professional, business-like, unemotional manner. However, the current relationship between the regulatory agencies and ZMI could hardly be described as "business-as-usual" in the context implied. The intense monitoring programs and special handling of materials now in place and proposed to be expanded in this EA are neither frivolously required nor implemented. Any

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specific monitoring concerns you may have should be clearly and specifically stated so they be addressed or clarified.

**COMMENT:**

1. In general, the technical evaluation of the subject seems sound. However, numerous (what we assume to be typographical/editorial errors made the document difficult to follow at times. We assume more time was taken developing the technical evaluation than was spent reviewing the document for readability.

**RESPONSE:**

Although considerable effort went into technical evaluation and many editorial corrections were made as the document developed, the agencies inadvertently neglected to do a spell-check after the final round of text revisions. Thank you for highlighting these errors. Publication of a revised document is not planned at this time. Should the document be re-published in the future, we will incorporate your corrections.

**COMMENT:**

2. Chapter III A. 1. - "clay chenbonitic shale" is referenced. We could not find "chenbonitic" in the DICTIONARY OF GEOLOGICAL TERMS and believe it would be appropriate to explain what chenbonitic shale is. Our assumption is that it will act as a cushion and is an aquitard. We hope that is correct.

**RESPONSE:**

The text should have read either "clayey shale" or "bentonitic shale". This shale layer is intended to function as an aquitard.

**COMMENT:**

3. The second full paragraph on page 46 reads "concentrations of cadmium and nitrate occasionally exceeded standards at site L-26 and L-25 these sites in 1991 and 1992, but . . ." You might want to explain what was meant there.

**RESPONSE:**

The words "these sites" should be deleted.

**COMMENT:**

4. Page 51, under Montana Gulch Waste Dump, states: This facility occupies an area of approximately 21 acres and has been is fully reclaimed . . ." Is this supposed to mean reclamation is done?

**RESPONSE:**

Your assumption is correct; the "is" should be deleted.

**COMMENT:**

5. Page 64, first paragraph, line seven, reads "The revised reclamation plan would decrease the previously permitted area of disturbance . . ." Is it increasing or decreasing the permitted area because of Mill Gulch waste dump?

**RESPONSE:**

The appropriate word was "decrease".

**COMMENT:**

6. On the same page under Sullivan Park Dike/'91 Leach Pad Contingency Pond, the sentence reads: "Some soil would be lost during the resalvaging process, but would be salvaged ahead of slope reduction." Should the sentence be as follows? "Some soil would be lost during the resalvaging process, but as much as possible would be salvaged . . ."

**RESPONSE:**

Correct. Your suggested edit would clarify the text.

**COMMENT:**

7. In CHAPTER VI - CONCLUSIONS AND RECOMMENDATIONS, the last sentence in the first paragraph brings up a question. The sentence states: "The selection of this alternative may alleviate the need for future long-term remediation." Our question is whether a sufficient bond exists to cover all the water handling, monitoring, and reporting (if not remediation) that is going to be necessary for years after mining to ascertain neutralization of pollutants/contaminants? The Appendix somewhat addresses this question as an answer to a question identified during scoping. The answer states: "Bonds are being raised to cover costs associated with ARD prevention under the reclamation plan." and that "A trust fund is one of several types of bonding which may be appropriate." We suggest that a great deal of scrutiny be used to appropriately size the bond to permit complete re-excavation and encapsulation of the acid forming rocks if it becomes necessary.

**RESPONSE:**

Bonding for water treatment, as well as surface and subsurface reclamation, is currently in place.

**COMMENT:**

8. In the same chapter, second paragraph under Capping, the sentence of concern reads: "In addition, ZMI would be required to use 15 nonacid-generating mil synthetic liners on areas with less than 5 percent grade over the clay layer." Should this say: "15 mil synthetic liners will be used over the clay layer, which will be placed over nonacid-generating blue waste rock." We do not think you want to have 15 different synthetic liners over the clay layer.

**RESPONSE:**

The phrase "nonacid-generating" should not appear in this sentence.

**COMMENT:**

9. The Engineering section on page 72 could use some work. As the section presently reads: "Diversion facilities must be redesigned to handle appropriate storm sizing based on ZMI's site-specific data."

**RESPONSE:**

Comment noted.



United States Environmental Protection Agency (EPA) - Region VIII  
Landusky

**COMMENT:**

1. The Environmental Protection Agency (EPA) has major concerns with the proposed action and we recommend that a full EIS be prepared to more fully evaluate needed ARD control. EPA does not believe the proposed alternative to be sufficient to meet either Clean Water Act nor Federal Land Policy Management Act requirements. Alternative B, the recommended action, is a significant improvement over the company proposed Alternative A and we compliment your staff for making such progress. However, Alternative B fails, in our opinion, to be sufficient to change the mine plan so as to be able to meet requirements of the Clean Water Act either now or after mine operations cease nor does it demonstrate that BLM's actions will be sufficient to prevent unnecessary or undue degradation.

As you know, this supplemental EA is based upon the need to modify the Zortman Mining, Inc. (ZMI) mine plan to control ARD.

**RESPONSE:**

Thank you for your comments. The agencies, BLM, as well as DSL, will continue to work toward rapid source controls to prevent unnecessary or undue degradation, will monitor as described in the EA, and will look at long-term prevention through an EIS. Until the proposed capping plans are implemented and proven effective, acidified water must be treated and discharged or used as make-up water for the processing circuit.

**COMMENT:**

2. It appears clear from actions described in the EA that BLM, EPA, and MDHES have determined that the ZMI Landusky mine facility is indeed in violation of the Clean Water Act and the Montana Water Quality Act, the Supplemental EA does not demonstrate that these violations will be corrected.

**RESPONSE:**

See previous response. The purpose of an EA is to describe effects of a proposed action- in this case implementation of source controls to minimize existing problems. A demonstration that violations will be corrected must be made by the appropriate enforcement agencies through the appropriate enforcement processes. If infiltration cannot be controlled or if groundwater is being acidified by direct contact with acid-generating material beneath facilities, then treatment systems will be necessary. The purpose of this EA was to review possible source control measures. The agencies do not guarantee that these measures alone will be adequate to guarantee compliance with the Clean Water Act or the Montana Water Quality Act, particularly in the short term. The agencies have not ignored the possibility of water treatment; in fact, treatment requirements are included in the Landusky and Zortman bonds held by the agencies. The proposed source control measures may alleviate the need for water treatment, and will certainly reduce the volume which would require treatment. ZMI is required to comply with water quality laws; currently, they are attempting to comply by recovering acid water and retaining it within the processing circuit. The EA did not evaluate other water treatment options because none have yet been proposed by the company for the Landusky mine. Such treatment, if or when proposed, would be evaluated in a separate environmental document.

**COMMENT:**

3. Page ii of the Supplemental EA states that efforts proposed by ZMI may not be extensive enough to ensure existing conditions are abated and future ARD is prevented. Even though the Supplemental EA recognizes that the same concern is equally true for the Agency Modi-

fied Alternative, few performance criteria have been selected to demonstrate success. The main problem appears to be with the approach BLM/DSL staff take with this Supplemental EA. There appears to be an unstated assumption that the proposed agency action of improved ARD source control through selective handling, capping, and diversion will be adequate to meet regulatory requirements. This is the same failed approach used by BLM and DSL for the previous EAs, that is that mining would be confined to oxide ores with little potential for acid generation. As we now know, that assumption proved false.

**RESPONSE:**

Agency assumptions differ from EPA assumptions. a) DSL and BLM previously required special handling of segregation materials to assure potential problems were minimized and the agencies required monitoring which was then successfully used to identify the need for a change of plans. b) The EA cites specific research to draw specific conclusions that the proposed and preferred alternatives would improve ARD source controls. If EPA has research documents which provide contrary information, EPA is obligated to provide that information to the DSL and the BLM. It is probable that some acidic seepage will continue after capping, particularly in the case of the Sullivan Park underdrain. If seepage volumes are significant, additional reclamation/source control measures, or treatment, will be required. The need for additional measures can best be determined based upon monitoring the effectiveness of capping. The agencies are not taking the same approach to the Landusky mine that they did in the past. The agencies are considering all options for restoring water quality. Relying upon perpetual treatment from the outset is not the preferred choice of DSL/BLM because that philosophy may discourage efforts to control the sources of contamination from being thoroughly pursued. Both active treatment and source controls can improve water quality; although active treatment is more certain to achieve appropriate discharge standards, it is dependent upon continued government mandate for future protection of water quality. Therefore, the most environmentally protective course of action is to maximize the implementation of passive ARD control measures and also require that all discharges meet appropriate standards. This requirement would likely result in the construction of treatment facilities. Bonding would cover costs of construction and maintenance of such facilities.

**COMMENT:**

4. A better approach is for BLM and DSL to require ZMI to demonstrate that ARD source controls are indeed effective. Selective handling, capping, and diversion may indeed result in correction of ARD releases to the surface water, but this must be proven in the field, not assumed. If these actions do not result in adequate ARD control, BLM and DSL should require ZMI to implement proven technology for meeting appropriate State water quality standards. The only proven technology to meet water quality standards, once acid generation has begun, is an optimized combination of source control, water management, and active water treatment. Active water treatment post-closure should be assumed to be needed until other practices can be demonstrated.

**RESPONSE:**

Monitoring will quantify the effectiveness of source controls. No quantitative assumptions have been assumed by the agencies. If these technologies do not result in adequate ARD control, the agencies would require the additional use of additional proven technologies. Specifically, Chapter VI commits to the use of monitoring results to determine the need for additional modification. The scope of active treatment is tied to ongoing litigation. Monitoring has not yet indicated active treatment is necessary at Landusky. These data in addition to being summarized in the EA are available in copies of monitoring reports that EPA

has on file. If it is necessary, it will be tied into the active treatment system already being implemented at Zortman. A comprehensive long-term water management and treatment plan will be evaluated in the forthcoming EIS. ZMI's proposal (ZMI, 1993a and ZMI letter dated January 24, 1994) includes extensive test plot studies intended to compare the effectiveness of different capping scenarios. In addition, instrumentation (lysimeters, thermistors, pore gas samplers) of Mill Gulch waste dump has been proposed for analyzing the geochemical effects of proposed source controls. Rather than wait for results of these studies, the agencies elected to require the "maximum cap" in Alternative B. If the results of test plot studies indicate that it is appropriate, capping requirements will be modified. Regardless of capping (source control), ZMI will not be allowed to discharge water which does not meet appropriate standards.

**COMMENT:**

5. These proven technologies should be specified in the amended mine plan and then assured through BLM's and the State's bonding procedures based on the assumption active water treatment may be needed. The BLM and DSL should not defer the requirement to provide for the financial contingency for active water treatment.

**RESPONSE:**

As EPA has been previously informed, the agencies are holding bond which includes active treatment costs. The agencies would be willing to consider any specific calculations EPA wants to provide.

**COMMENT:**

6. This burden to require active water treatment is unfairly placed on the Montana Water Quality Bureau (as noted on page 7 of the EA). But as mine bonding authority is your joint agency obligation, this should be addressed in the next NEPA analysis.

**RESPONSE:**

The Water Quality Bureau is responsible for setting effluent limitations and determining what level of treatment is appropriate. While DSL/BLM can require that ZMI comply with water quality laws, it is the responsibility of WQB to determine whether or not ZMI is in compliance. It is not "unfair" to place this "burden" on WQB since their requirements will ultimately determine the form and degree of water treatment necessary. The language was not an effort to inappropriately burden WQB and EPA.

**COMMENT:**

7. This EA should have assessed the expected water quality after the proposed alternative is implemented. Then a determination could be made whether the proposed action is sufficient to meet appropriate State water quality standards and meet BLM requirements to prevent undue and unnecessary degradation. This ARD control plan simply fails to set specific quantified goals or standards for ARD control. The expectation that the proposed plan will control ARD should not become the basis for BLM's or DSL's decision.

**RESPONSE:**

See response to Comment 2. ARD control levels are established by the Clean Water Act and the Montana Water Quality Act, not the EA. The EA did assess expected water quality impacts (P. 58: "...acidic seeps may continue..."). As noted in the conclusions (P. 71)

"...acidification of water would be reduced ...which...may alleviate the need for long-term remediation." (e.g. active treatment). The conclusions clearly show that the agencies are not relying on these measures to guarantee complete remediation; however, Alternative B is a positive step toward full remediation of the existing problems.

**COMMENT:**

8. The Supplemental EA does not address the likelihood of acid mine generation continuing after capping and regrading. Acid mine generation is very difficult to control, especially once it has started. The alternatives need to be amended to mitigate any continuing problems with ARD. Possible alternatives include using limestone as capping material instead of non-acid-generating waste until assumptions about percent sulfur are demonstrated; maintaining the pump-back systems for the 100-year, 24-hour storm until the ARD problem is resolved; and installing complete containment or water treatment plants at any mine units discharging ARD in violation of appropriate State water quality standards.

**RESPONSE:**

See previous response. As noted in the EA, page 23, ¶ 2, the agencies are requiring that capping materials (i.e. rock placed above infiltration barriers) have a neutralizing potential greater than three times its acid potential as well as a net neutralizing potential greater than + 20. This requirement could be revised if ZMI can refine blue waste classification based upon long-term kinetic testing or if EPA has access to additional data which would modify the conclusions previously reached. If EPA has such data, it is obligated to provide it.

The means by which ZMI achieves discharge criteria is not at the discretion of DSL/BLM.

**COMMENT:**

9. The Supplemental EA appears to put "all its eggs in one basket" with one basic alternative of a "regrade and cap." The EA does not take into account ground water movement through these materials as a source of ARD. Capping and regrading may help mitigate ARD driven by surface water. However, it will have no effect on ground water passing through mine units and conveying ARD. The EA needs to identify areas of historic seeps and gaining streams, and develop additional ARD mitigation alternatives.

**RESPONSE:**

See response to comments 1 and 2. The agencies have not put "all its eggs in one basket" hence the monitoring requirements. See the groundwater discussion on pages 59 and 60. Obviously, regrading and capping do not preclude or impair DSL, BLM, EPA, or DHES from implementing additional treatment options.

**COMMENT:**

10. Specific standards and measurable ARD control goals and performance assumptions are lacking. A clear correlation between the percent sulfur and potential for acid generation has not been established based on field studies. Yet the plan depends upon so called "blue waste", which is based on percent sulfur, actually performing as non acid-generating material until the results of field studies are available. The design basis for ARD control measures is not specified in the Supplemental EA. The thickness of the proposed clay caps are defined, but the design criteria needed to adequately prevent infiltration is not. A basis for determining success or failure of any of the ARD controls has not been specified. The sources of ARD have not been fully identified -- for example, is it the heap leach dike, the



bedrock beneath it, or the foundation materials? The EA identifies all three possibilities for the Sullivan Park heap leach dike, but only the dike is selected for ARD control by clay capping. What are the predicted performance of the control measures compared to specific goals? What is the demonstrated technology to meet the specific goals? What contingencies are planned if goals are not attained? Is the bonding sufficient to implement the proven technology should that be warranted? These issues are not adequately addressed in the Supplemental EA.

**RESPONSE:**

Specific water quality standards are established by the Montana Department of Health and Environmental Sciences. The DSL/BLM have no authority in this matter other than to require compliance with applicable laws (e.g. the Water Quality Act. The agencies have placed additional restrictions on capping material quality (Environmental Assessment, page 23). In addition, the sulfur cutoff and other segregation criteria may be modified with time as kinetic studies proceed. If EPA has additional data which can be used to modify these criteria, EPA must provide it to the agencies.

The basis for determining success or failure of ARD source controls is measurable decreases in the volumes of acidic effluent. As previously noted, if capping alone does not eliminate the problem, additional measures such as water treatment would be required.

**COMMENT:**

11. As you know, EPA raised the issue of preparing a full environmental impact statement (EIS) pursuant to 102 of NEPA in 1990 when the Sullivan Park leach pad was proposed. At that time the Montana Department of State Lands acknowledged that "before any major amendments would be issued in the future, the Department would prepare an EIS, particularly if any significant amount of sulfide ore were to be mined...". (Letter from Dennis Casey, Department of State Lands, to John Wardell, EPA, June 12, 1990.) In view of the significant water quality problems now evident at the Landusky mine due to the mining of sulfide bearing materials, it is time to live up to that EIS commitment. Since the 1984 MOU commits BLM to joint NEPA analysis with DSL, we think this letter implied a similar commitment from BLM.

**RESPONSE:**

Comment noted. No major amendment has been proposed. The agencies are only evaluating corrective actions. No additional ore reserves have been proposed for mining and no additional disturbances are proposed. Nonetheless, the agencies have decided that certain aspects of this modification would be better analyzed in an EIS.

**COMMENT:**

12. It is important to note that we do not believe that continuing to mine is particularly significant to the environmental concerns of ARD control since the ore is already loaded on the existing leach pads and the open pits must be eventually corrected for ARD control at the post-mining phase. Therefore, we have attached a separate analysis outlining the need and possible scope of a full EIS for ARD control for the Landusky mine. Also attached are additional details of EPA's technical review of the Supplemental EA for the Landusky Mine Operating and Reclamation Plan Modifications for ARD Control and Remediation.

**RESPONSE:**

Thank you for your comments.

**COMMENT:**

13. "To date, impacts have not been severe.... This type of undocumented statement seems inappropriate since BLM, DHES, and EPA have all cited the facility for discharge without a permit under the Clean Water Act. The data to support this claim on lack of severity has--not been presented since the water quality impacts below some of these facilities exceeds water quality - standards.

**RESPONSE:**

The statement in the document summary represents a conclusion based on more detailed documented text. Summaries are, by definition, brief.

The statement in the EA is basically correct. There have been no impacts to domestic water supplies. There have been no impacts detected to wildlife or fisheries. The ARD problem is not present in drainages that flow onto the Fort Belknap Reservation. And the impacts are not prevalent beyond the mine permit boundaries. This is substantiated by the monitoring data. That does not mean the problem is not serious or does not deserve attention. The fact that violations have been issued says nothing about the impacts. A violation may be issued for simply not having a permit, regardless of the impacts.

**COMMENT:**

14. The purpose and need for the action is to correspond to agency, EPA, and DHES requirements which are later expressed in the Agency Responsibilities section. The purpose of the Supplemental EA is not to respond to ZMI's recommended mine plan modifications, but to the agencies' requirements.

**RESPONSE:**

The EPA comment is inaccurate. The EA was written to provide an evaluation of the effects of making a decision on the proposal by ZMI (which in turn was submitted in response to a mandate by DSL and BLM). Both the BLM and DSL regulations require processing of the ZMI proposed modification by preparation of an EA. The BLM and DSL did require that a proposal be submitted, but not because of Clean Water Act (CWA) requirements. The process is outlined quite clearly in our regulations. EPA and WQB did not require the proposed mine plan modifications (and still haven't). In fact, the first notice of violation was not even served on ZMI until after the modified Plan of Operations had been submitted and the EA was underway. EPA seems to be under the mistaken impression that the agencies are processing this mine plan modification because of the CWA requirements or the State's Water Quality Act requirements. The modifications were required based on BLM and DSL dissatisfaction with the impacts generated by the ongoing operation. That these impacts have been determined by another agency to not be in compliance with the CWA is of interest, but is not the driving force for the modifications. The BLM and DSL cannot assume compliance authority for the CWA. The DHES and EPA actions are not directly related, and those agencies became involved after DSL and BLM had made them aware of the developing acid drainage problems at the mine.



**COMMENT:**

15. "Because of these precipitation events, pumpback systems at the Landusky mine were not able to capture all discharge of acidic water downgradient of certain facilities." Our field inspections indicated that the pumpback systems would not capture 100 percent of the discharge even if these storm events did not occur. We do not have enough information to know if the pumpback systems could have contained even an average spring runoff. The EA should not imply that the pumpback systems could contain 100 percent of the flow normally, even without large storms. A more accurate statement would be that the pumpback systems were inadequate during these storms and may have been inadequate for less frequent storms.

**RESPONSE:**

Comment noted.

**COMMENT:**

16. It is indicated that 3 feet of NAG waste will be placed as a "capillary break" which is intended to prevent root penetration into the liner. The plan should specify material size to assure that the water coming out of the capillary break material drains properly since with too great a difference in size difference with the soil material could cause the soil to remain saturated.

**RESPONSE:**

Comment noted.

**COMMENT:**

17. Utilizing a materials characterization scheme based on a modified ZMI system of "green, yellow and blue wastes" is not recommended. This classification, which utilizes percent sulfur as the basis for defining whether or not waste material may be acid-producing, is based on average values from static tests of samples collected from blasthole drilling in the pit benches. Wastes with ABA values within the range of uncertainty, have not been tested further by kinetic methods, and thus can not be reliably considered non-acid-generating. For instance, the average NNP for yellow waste, which is one of the materials recommended for the capping sequence, is 1.11, when the accepted cut-off for non-acid-producing material is +20.

**RESPONSE:**

As noted in the EA, ZMI will be required to validate their waste classification scheme with kinetic tests. In the mean time, more stringent standards will apply. See page 23, ¶ 2 and page 25, ¶ 4 of the Environmental Assessment.

**COMMENT:**

18. It appears that the Agency Modified Alternative amends the definition of "blue waste" to "Non Acid-generating (NAG) to be defined as 1) net neutralization potential greater than 3 times the net acidification potential (NNP > 3AP) and 2) net neutralization potential greater than +20. We strongly support this agency modification as an example of specific performance criteria if these are applied with field testing. However, it is not clear where this new definition for NAG material applies -- only to the capillary break above the clay liner

and not to the resloped dump slope? Shouldn't this also apply to the NAG coarse rock fill for the bench and side drains?

**RESPONSE:**

The statement is correct. Dump material beneath the compacted clay liner would be "yellow" waste. DSL/BLM's requirement of  $NP > 3AP$  and  $NNP > +20$  would apply to any material above infiltration barriers, including capillary break material and diversion riprap.

**COMMENT:**

19. Since the agencies recognize not all "blue waste" would meet this criteria and this criteria can only be demonstrated with long-term leachate extraction testing in the field," we recommend an interim solution until that occurs. Rather than stockpiling Bighorn Dolomite or Emerson Shale for this purpose, the agencies could require ZMI to place limestone where ever NAG is specified in the agency modified plan. Placement of limestone or limestone amended wastes would continue until such time as the field tests are adequate to demonstrate the non-acid-generating character of "blue waste. We recommend that limestone material be placed in contact with, and immediately on top of, dumps and leach pads containing any acid-generating material. This limestone would then be covered by a clay liner, followed by a synthetic liner and capillary break material of adequate thickness, with definite non-acid-producing characteristics, and a final layer of topsoil. We also recommend that coarse limestone be utilized as rock fill at the bottom of the bench drains, side drain ditches and diversions in the leach pads and the pits. Limestone is readily available in the immediate Zortman Landusky area and could be obtained at low costs. It would provide capping material which is far superior to the mine waste material now being considered, due to its neutralizing potential and definite known non acid-producing character.

**RESPONSE:**

Bighorn dolomite and Emerson shale, as well as limestone, have been demonstrated to be adequate capping materials; those rock types have positive neutralizing capacities.

Placement of limestone beneath clay liners is not warranted. The purpose of the liner is to seal off underlying acid-generating materials. There is no reason to place limestone beneath these barriers.

It is an agency goal to minimize mine-related disturbances, including unnecessary quarrying of limestone. The limestone cliffs and ridges of the Little Rocky Mountains provide much of the range's scenic beauty and destruction of these outcrops should be kept to a minimum. As noted above, material to be placed over infiltration barriers will be required to have a neutralizing potential greater than three times its acid potential as well as having a net neutralizing potential of at least  $+20$ . Other materials may be used only if verified non-acid-generating through adequate kinetic testing and approved by the appropriate agencies.

**COMMENT:**

20. Thus, the EA should clearly define the characteristics of the backfill material which will be utilized for capping pits, heap leach pads, and waste disposal facilities. This definition should be based on a thorough characterization of the acid-producing potential of the material, as defined by the agencies, and not on ZMI's "blue, green and yellow" characterization scheme for mine waste which is based on a correlation between % S and Static testing conducted on waste samples from blasthole drilling in the pit. Even though the agencies

modify ZMI's characterization scheme in certain instances, this tends to lead to confusion, like "yellow" waste being termed NAG (non-acid-generating) in the section dealing with the alternate capping sequence (page 23 and figure 9).

**RESPONSE:**

Please note that there is no confusion in DSL/BLM (or on page 23 of the EA) about the use of "yellow" waste. As this material is to be capped with compacted clay, it is not required to be verified non-acid-generating. Figure 9 contains an error; this is a ZMI figure which was specific to the capping proposal for the Mill Gulch Dump. For the EA, the term "NAG" should have been replaced by "yellow." We do not encouraged the use of the abbreviation "NAG" because some mines use this acronym to denote "net acid-generating" rock, and others to denote "non acid-generating" rock.

**COMMENT:**

21. Further, the field testing requirements to characterize the backfill material discussed above should be defined. These requirements should cover both short-and long-term testing, and include column tests with coarse material representative of the waste from the pits, and insitu measurements of existing geochemically active piles.

**RESPONSE:**

Field testing and monitoring is discussed in ZMI's Landusky reclamation plan revision application (ZMI 1993a). The discussion of this testing was edited out of the EA and replaced by requirements for a "maximum cap" scenario.

**COMMENT:**

22. Which is the minimum size storm? Is it the 6-or 7-inch, 100-year, 24-hour storm event? Both are mentioned on page 26.

**RESPONSE:**

The minimum size storm depends upon the nature of the diversion in question. As noted on page 26, permanent diversion channels across or around capped facilities would be designed to handle a 7" 24-hour storm. "Non-critical" diversions would be designed for a 6" event.

**COMMENT:**

23. The proposed well on the west side of the Landusky processing yard is not described whether this in alluvial or a bedrock well? What is intended to be monitored for this site? The proposed bedrock well in King Creek is a sound idea to monitor water quality in the bedrock. However, the proposed alluvial/bedrock contact well in King Creek should be screened only in the alluvium and not across the contact.

**RESPONSE:**

The well in the processing yard would be a bedrock well. The alluvium is thin in this area. The purpose of the well would be monitoring for leaks from the pregnant pond.

**COMMENT:**

24. The provision for the company to provide the quarterly trend analysis is a good direction that may augment the agencies' ability to identify trends earlier than previously possible when only the raw data was submitted annually. The agencies should specify to ZMI what will be provided for trend reports based upon appropriate statistical methods with agency review.

**RESPONSE:**

Comment noted.

**COMMENT:**

25. What would be storage capacity needed for the entire complex for the 6 or 7-inch storm event?

**RESPONSE:**

There are approximately 285 acres of leach pads at the Landusky mine. For a 6-inch precipitation event this equates to 142 acre-feet, or 46 million gallons, of water. The Zortman-Landusky process circuit has a total capacity of approximately 452 million gallons, and typically operates at 60 percent of capacity (270 million gallons). Therefore, under normal conditions, the leach pad circuit has additional capacity to store approximately 24 inches of precipitation.

**COMMENT:**

26. No discussion is provided of the connection between Gold Bug pit and the old workings that were intercepted - one might assume that the pit drainage would flow into the old workings. Has ZMI already filled above the level of the adit with the clay cap or are they still below it? No criteria is specified regarding the in place 6" clay cap to define its ability to prevent infiltration.

**RESPONSE:**

The old workings of the Gold Bug adit were 60' below the original Gold Bug pit bottom prior to backfilling. The clay barrier is 90' above the original pit bottom. The clay barrier was installed in July of 1993. Dump construction has continued above this level since that time.

**COMMENT:**

27. What ARD controls would be appropriate to consider since the area under the Sullivan Park pad may contain acid-producing rock in the underdrain system or in the exposed bedrock beneath the underdrain? Isn't full pumpback using the existing slurry wall during mining and post-mine active treatment needed for these sources? (See also page 60 which recommends a passive wetland treatment system.)

**RESPONSE:**

Full pumpback is necessary at this time. If capping of the dike does not completely correct the ARD problem, treatment may be required. This is one of the issues we intend to analyze in the upcoming EIS. Page 60 states that construction of a water treatment facility

would be required to assure protection of water quality. A constructed wetland is an option, which may be effective for Sullivan Park, but it is not the only option being considered. Treated discharges must meet appropriate standards.

**COMMENT:**

28. The statement is made that the mine generated ARD will not use up the neutralizing capacity of the carbonate gravels because large flood events bring fresh rock into the system capable of providing effective neutralization. There is no data to support this claim. This hypothetical discussion is inappropriate in describing the existing affected environment.

**RESPONSE:**

The document does not state this to be a certainty (See page 89). On page 60, the document does not say that flow over carbonate rocks would remove all metals from solution. The discussion pertains to the no action alternative which has not been selected. The agencies are not relying on existence and replenishment of carbonate gravels in affected drainages to control acid drainage. Proposed source controls and, if necessary, treatment, are intended to prevent ARD or treat it prior to reaching drainages.

**COMMENT:**

29. Regarding water quality at site L-28 in upper Sullivan Creek, the statement is made that "there is no discharge to surface waters, as water collected in this pond is diverted into the processing circuit." Field inspections by the Montana WQB and EPA cannot verify that this flow is indeed routed entirely into the processing circuit. This statement should be amended to reflect this uncertainty.

**RESPONSE:**

Comment noted.

**COMMENT:**

30. It is stated that the Madison aquifer cannot serve as a source for domestic or municipal water supply since TDS often in excess of drinking water standards. However, according to the Safe Drinking Water Act, the Madison here is considered to be an underground source of drinking water since the TDS is less than 10,000 ppm.

**RESPONSE:**

Agreed; however, depth to the Madison aquifer is typically prohibitive of well drilling, except within a mile of the Little Rocky Mountains. Sulfate concentrations average greater than six times the secondary MCL (Feltis, 1983), frequently making this water unpalatable. The Madison could still function as a drinking water supply, however, because secondary MCLs are not enforceable, and because conventional treatment would reduce sulfate concentrations.

**COMMENT:**

31. It is stated that samples from the three wells that were lost due to expansion on the Mill Gulch waste rock all contained arsenic and sometimes high cadmium, high sulfate, and high TDS. It is further stated that because only ZL-128 showed any water quality trends, the



metal concentrations are most likely characteristic of pre-mining water quality. What is the basis for this statement?

**RESPONSE:**

Groundwater monitored by ZL-128 has been impacted by mine-related disturbances. Between May 1989 and September 1991 sulfate concentrations at this sampling point rose from 83 mg/L to 401 mg/L. In well ZL-129, the concentration changed from 188 mg/L to 185 mg/L during the same period. In well ZL-130, the concentration changed from 168 mg/L to 134 mg/L between those dates. Meanwhile, the sulfate concentration upgradient at surface water monitoring station L-26 increased from 76 mg/L to 1710 mg/L. Surface water site L-26 and well ZL-128 showed impacts from sulfide oxidation within the Mill Gulch dump. Wells ZL-129 and ZL-130 did not. Therefore, the water quality within the latter two wells is presumed to represent background conditions in bedrock beneath the dump.

**COMMENT:**

32. Here it is recognized that "Although the quantity of seepage from the these facilities would be reduced, the quality of residual seepage may not improve and could become worse" (emphasis added). Thus the next statement that mixing of this seepage with unimpacted seeps and diverted runoff should dilute any residual acidity cannot be verified. Under some circumstances, reduction of the available dilutional capacity of the infiltration into the waste rock pile through capping could indeed result in less diluted and hence higher metal concentrations in the interstitial pore space. Subsequent infiltration, i.e. that remaining after partially effective capping, would then move the lower pH higher metal laden leachate down. If this leachate were then mobilized by underlying groundwater, conditions could be exacerbated rather than abated by partially effective capping.

**RESPONSE:**

It is extremely unlikely that capping a facility would worsen overall water quality. For example, if capping is "partially effective" and reduces current infiltration rates by 95 percent, but residual water within the facility becomes twice as concentrated in contaminants, resulting metals loading should still be reduced by an order of magnitude. If predictions are wrong, water can be treated or capping improved to further reduce impacts.

**COMMENT:**

33. We recommend that the suggestion that a wetland be used in this contingency be further expanded to state that whatever system is implemented would have to meet appropriate State water quality standards. Passive treatment by a wetland system, if proposed, would have to demonstrate the ability to meet such standards.

**RESPONSE:**

Although not explicitly stated in this instance, ZMI must be in compliance with the Water Quality Act. If this is not the case after mining terminates, bond would not be released. Continued water treatment would be required. Furthermore, for ZMI to receive approval for mine expansions, they must demonstrate that new activities will not cause unacceptable degradation (subject to review by the WQB) and that they are resolving existing water quality problems.

**COMMENT:**



34. EPA recommends that BLM and DSL prepare an EIS for significant modifications to the Landusky Plan for the reasons noted below:

a) BLM has not prepared an Environmental Impact Statement as contemplated by Section 102(2)(c) of NEPA for its federal actions taken pursuant to the Federal Land Policy and Management Act (FLPMA, PL 94-579) of approving Operating and Reclamation Plans by ZMI and Pegasus for the Landusky Mine. Instead, BLM has relied upon a series of five (5) Findings of No Significant Impact (FONSIs) and Environmental Assessments (EAs). This includes the FONSI and Supplemental EA issued January 25, 1991 for Amendment No. 10 which approved the Sullivan Park heap leach pad. A Supplemental EA on the Landusky Mine Operating and Reclamation Plan Modifications, Acid Rock Drainage Control and Remediation, State Operating Permit 00095 and Federal Plan of Operations MTM-77779 was prepared in November 1993. BLM acknowledges that the environmental findings of these FONSIs and EAs are no longer valid since there are significant new circumstances relevant to environmental concerns. Further, 40 CFR 1502.9 requires federal agencies to prepare a supplemental EIS when: "There are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts."

**RESPONSE:**

a) The comment is not quite accurate when it states that BLM has not prepared an Environmental Impact Statement as contemplated by NEPA for its federal actions approving ZMI's Operating and Reclamation Plans for the Landusky Mine. In 1979 an EIS was prepared by the DSL for both the Zortman and Landusky Mines. After BLM regulations went into effect in 1981, a MOU was signed with DSL which accepted their authorization for existing mining projects. As EPA pointed out in an earlier comment, the MOU commits BLM to joint NEPA analysis with DSL. The 1979 EIS is essentially a BLM document by virtue of the MOU.

The CEQ regulations at 40 CFR 1502.9(c) and BLM manual H-1970, allow the agencies to supplement the environmental analysis, in this case, the EA for Amendment 10, and not necessarily to prepare a supplemental EIS. Either an EA or an EIS may serve to meet this requirement. Nonetheless, the agencies have decided to prepare an EIS for the long-term reclamation measures as described in the decision record.

**COMMENT:**

b) Pursuant to 43 CFR 3809 and 302b of FLPMA, BLM has determined that significant modifications to the Landusky Mine Plan of Operations are required to ensure that unnecessary or undue degradation does not occur (BLM, April 1993). BLM and DSL have released a Supplemental EA on the significant modifications needed to the approved Landusky Mine Plan of Operations. Upon completion of this Supplemental EA, BLM and DSL will then determine if that action is significant as contemplated under NEPA and MEPA to warrant preparation of an EIS.

**RESPONSE:**

CEQ regulations are based on significant effect, not on "significant modifications." The terms are neither mutually inclusive nor exclusive. A significant modification is not necessarily a federal action having a significant impact on the human environment.

**COMMENT:**

c) BLM either has or will take significant federal actions at the Landusky Mine which may have an adverse impact to the environment. However, pursuant to CEQ regulations at 40 CFR 1506.1 agencies are not to take action concerning the proposal which would: 1) have an adverse environmental impact; or, 2) limit the choice of reasonable alternatives. BLM has taken actions and plans to take actions in the near future to address newly discovered ARD problems without undertaking the necessary NEPA analysis to show that these corrections will be successful or have contingency plans if they are not successful. The Significant Modification to the Plan of Operations analyzed by BLM in the Supplemental EA of November 1993 is not sufficient to assure that new ARD material can be handled by ZMI to avoid undue and unnecessary degradation.

**RESPONSE:**

The remediation that has occurred to date includes enhanced monitoring, capture and return of contaminated effluent, selective handling of waste rock, and relocation of waste rock in areas of previously permitted disturbance. These actions have been taken to prevent adverse impacts to the environment, yet retain a choice of reasonable alternatives to address long-term mine closure needs. Such actions are within the scope of existing NEPA analyses and program regulations. The actions analyzed in this EA are interim until an EIS can be prepared.

The term "unnecessary or undue degradation" is from FLPMA with the implementing regulations developed by BLM under 43 CFR 3809. The term has a definite regulatory meaning which is the responsibility of BLM. The term relates to the approvability of a project and not to the level of significance regarding impacts. The two criteria are totally different.

**COMMENT:**

d) EPA recommends the following BLM and DSL actions should either be the subject of an EIS or be proven either: (a) not have a significant environmental effect or (b) are justified independently so as not to prejudice the ultimate decision:

- 1) the post-mine reclamation plan for all Landusky pits determined to be adequate to ensure ARD control to prevent undue and unnecessary degradation, and
- 2) sufficient ARD control during and post-mining for all Landusky leach pads and waste rock disposal piles adequate to meet appropriate State water quality standards, and
- 3) adequate financial assurance to provide for proven technology to control releases to meet performance standards both during mining and post-mine closure.

**RESPONSE:**

Thank you for your comments.

EPA references:

BLM and DSL, January 15, 1993 - Letter to James Geyer, Zortman Mining, Inc. from David Mari, BLM Lewistown District Manager and Sandra Olsen, Montana Department of State Lands, with attachments, page 1.

BLM and DSL, February 3, 1993 - Enclosure to January 1993 letter entitled "Landusky Mine Situation Report and Reclamation Plan Review", 8 pages.

BLM, April 13, 1993 - Certified letter to Zortman Mining, Inc. and Pegasus Gold Corp. from Robert H. Lawton, BLM State Director, page 1, emphasis added.

# Supplemental Data

			Analysis of Variance						
			Analysis based upon two random data sets derived by sampling every third sample from a master population of 391 blast hole samples						
Test 2	Test 3								
0 022	0.024		Anova: Single Factor						
0 031	0.023		Columns A & B (Alpha = .05)						
0 025	0.107		Summary						
0.035	0.033								
0 037	0 032		Groups	Count	Sum	Average	Variance		
0.028	0 021								
0 379	0 208		Column 1	130	23.698	0.182292	0.046822		
0.057	0.088		Column 2	130	23.058	0.177369	0.040329		
0.039	0.027								
0.087	0.062		ANOVA						
0.042	0.036								
0 298	0.244		Source of Variation						
0 043	0.022			SS	DF	MS	F	P value	F crit
0 121	0 163		Between Groups	0.001575	1	0.001575	0.036153	0.849349	3.877744
0 198	0.069		Within Groups	11.24248	258	0.043576			
0 055	0 053								
0.027	0 716		Total	11.24405	259				
0.032	0 031								
0 023	0 022								
0.03	0 042								
0 051	0.337								
0.098	0 055								
0 031	0 102								
0.085	0.081								
0 118	0.08								
0 096	0 037								
0.23	0 037								
0 106	0.39								
0 344	0 322								

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0 08	0 079								
0 1	0 077								
0.056	0 027								
0 041	0 055								
0 264	0 169								
0.087	0 348								
0.271	0 17								
0.293	0.265								
0.056	0.015								
0 026	0.021								
0 026	0 049								
0 143	0.105								
0.065	0.076								
0 123	0 155								
0 118	0.202								
0 225	0 212								
1 25	0 234								
0 792	0.451								
0 147	0 585								
0 582	1.39								
0 387	0.396								
1 32	0.626								
0.501	0.424								
0.52	0.266								
0 47	0.283								
0 041	0 012								
0 031	0.001								
0 104	0 093								
0 107	0 091								
0 024	0 022								
0 061	0 212								
0 402	0 418								
0 114	0.024								
0.053	0.024								
0 03	0.042								
0.138	0.152								
0 211	0.237								

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0.039	0.036								
0.024	0.038								
0.597	0.176								
0.042	0.034								
0.129	0.237								
0.144	0.167								
0.132	0.135								
0.176	0.175								
0.164	0.08								
0.085	0.099								
0.776	0.475								
0.256	0.14								
0.998	0.663								
0.048	0.018								
0.368	0.507								
0.126	0.112								
0.156	0.228								
0.053	0.048								
0.066	0.213								
0.164	0.154								
0.191	0.327								
0.12	0.07								
0.024	0.039								
0.029	0.099								
0.248	0.216								
0.333	0.318								
0.202	0.046								
0.066	0.051								
0.024	1.14								
0.23	0.235								
0.141	0.23								
0.188	0.108								
0.059	0.024								
0.13	0.482								
0.189	0.132								
0.139	0.287								
0.187	0.146								



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0 554	0.075								
0 451	0 461								
0 195	0 09								
0 015	0 001								
0.176	0.177								
0.153	0.154								
0.221	0.277								
0.239	0.239								
0 148	0 174								
0.194	0.211								
0 284	0 193								
0 183	0 206								
0 176	0 186								
0 142	0 175								
0 18	0.127								
0.112	0 099								
0 113	0 131								
0 145	0.144								
0.202	0 12								
0.175	0.187								
0.17	0.108								
0.068	0.069								
0 162	0 051								
0 011	0.152								
0 076	0 09								
0 044	0 011								



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